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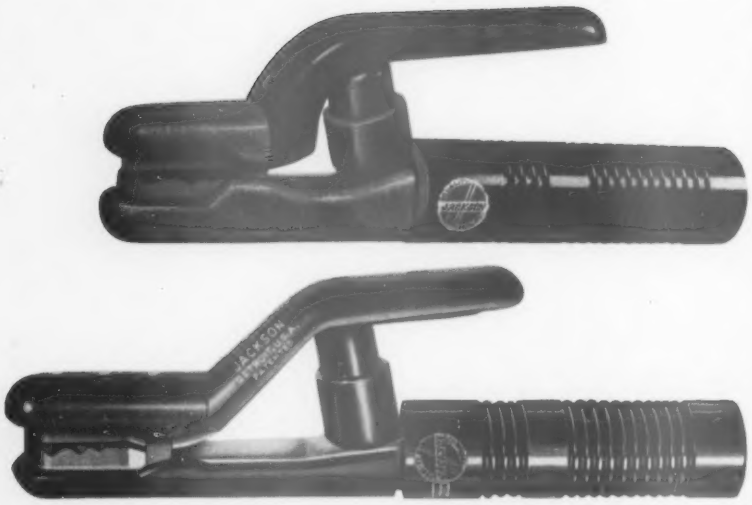
THE WELDING ENGINEER

FEBRUARY, 1953

Non-Magnetic Ship . . . . page 23



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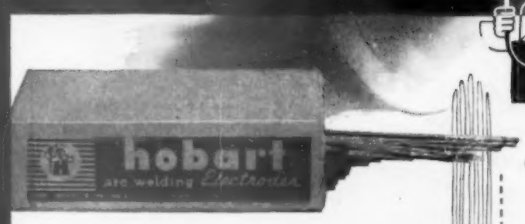

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THE WELDING ENGINEER

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VOLUME 38 NUMBER 2

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FEBRUARY, 1953

Cover: *Top priority defense job: assembling the outside armor of a tank destined for the U.S. Army. The weldors are using d-c arc-welding equipment and type 307 electrodes. Photo courtesy General Electric Co.*

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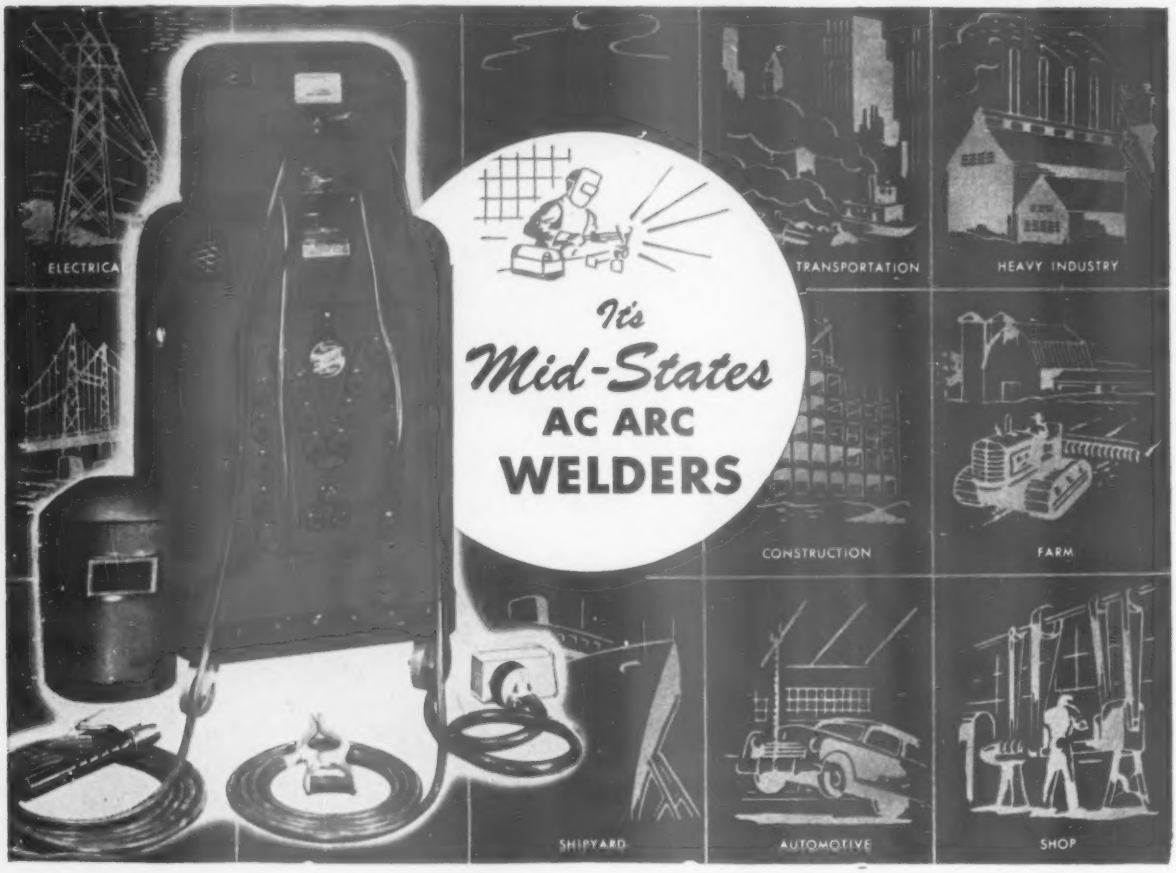

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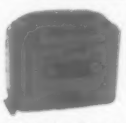

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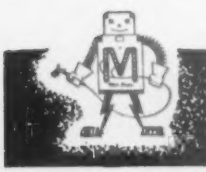
An indispensible accessory to every welding shop—for WELDING, BRAZING, SOLDERING, HARD SURFACING and PRE HEATING. Pure intense electronic heat, no pressure blowing, no burn-through on thin metals.



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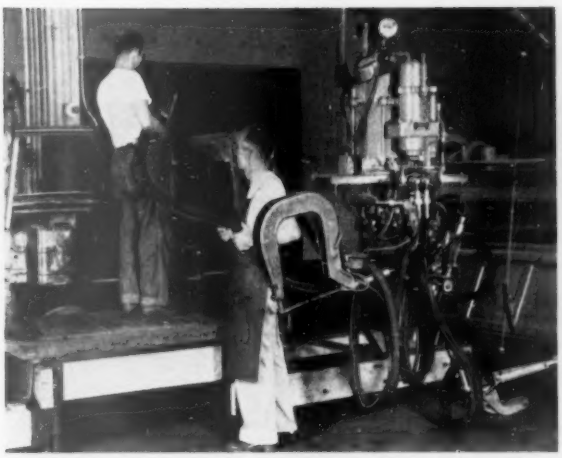
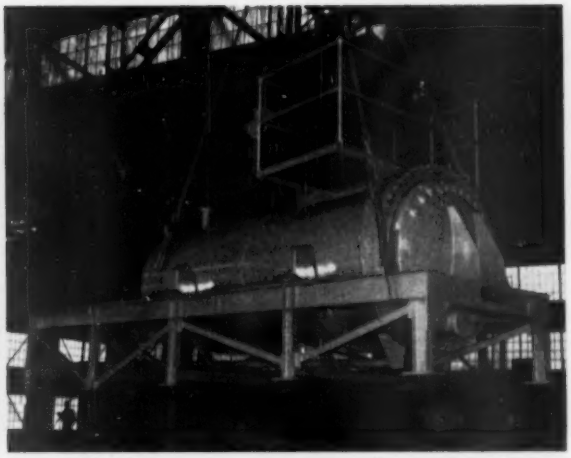


FACTORY-SIZE welding station helps International Harvester lab men at Fort Wayne, Ind. Time and money are saved by production-weld-testing new model designs



RETRACTABLE shell on new pressure filter makes it easier to maintain and operate. All-welded shell and mount were made by Dravo for basic aluminum plant

NEWS

Western Welding Firms To Exhibit in March

WEST coast sections of the American Welding Society and Pacific coast manufacturers of welding equipment will figure prominently in the Western Metal Congress, March 23-27, in Los Angeles.

AWS members will aid in the technical sessions at the Statler Hotel with papers and program arrangements. Manufacturers will exhibit their products at the Los Angeles' Pan-Pacific auditorium and in a specially-erected pavilion alongside it.

Herbert K. Clemens, Los Angeles AWS chairman, has appointed two local members to act as chairman and co-chairman for speakers and papers. They are William H. Skewis, VFP Co., and Hugo W. Hiemke, California Alloy Products Co., both of Los Angeles. Mr. Clemens, who is with C. F. Braun & Co., Alhambra, Calif., has asked E. O. Williams, Victor Welding Equipment Co., to serve in an advisory capacity.

Other technical societies that will present programs are the American Society for Metals, Society for Non-Destructive Testing, American Society for Testing Materials, American Foundrymen's Society, American Society of Safety Engineers, American Institute of Mining and Metallurgical Engineers.

News Highlights

- South's first electrode plant. Page 6.
- Welding panel featured at March ASTE Meeting. Page 66.
- 3-Day Welding Institute, Madison, Wis., Feb. 17-19. Page 73.
- $2,000 Eutectic Contest for 1953. Page 80.
- Welded plastic ducts for corrosive fumes. Page 84.

Browning to Leave National Production Authority

WILLIAM B. BROWNING, Branch Chief, Metal Working Equipment Section, National Production Authority, Department of Commerce, Washington, D. C., will leave that post late in February. He will return to the employ of Linde Air Products Co., it is reported.

* * *

Welded Filters Have Retractable Shells

(Right photo)

TWENTY-four retractable - shell - type pressure filters, for use in a new basic aluminum plant, were fabricated recently at the Pittsburgh plant of Dravo Corp. Developed by the H. W. North Co., Erie, Pa., filters of this design have a wide range of applications for pressure filtration in the chemical, metallurgical and allied fields.

Made entirely of welded steel, the shell is 14 ft long by 60-in. in diameter. It is mounted horizontally in a steel framework and rides on roller bearing wheels, being retracted by a screw-traversing mechanism. Full exposure of the filter-leaves without disconnecting the piping enables an operator to service the equipment quickly, and conveniently. Head of the unit is stationary and is breech-locked to the shell by remote control.

Convention Date Book

Feb. 5-6; western zone meeting, National Welding Supply Association, Mark Hopkins Hotel, San Francisco.

* *

March 23-27; Western Metal Congress and Exposition, Statler Hotel, Los Angeles.

* *

April 13-15; International Acetylene Association, Biltmore Hotel, Atlanta, Ga.

* *

May 10-12: National Welding Supply Association, national meeting, Sheraton-Gibson Hotel, Cincinnati, O.

* *

June 16-19: first national spring technical meeting of The American Welding Society, Shamrock Hotel, Houston, Tex.

NEWS

from page 5

18½-FT DEEP BEAM, biggest ever made south of the equator, was recently welded in Australia

LIFE EXPECTANCY of truck-center castings for locomotive tenders was boosted 3 to 4 times by flame-hardening process

Huge Beam 18½-Ft Deep Welded in Australia

A NEW submerged-arc welded beam fabricated in Sydney, Australia, is believed to be one of the largest in the world and certainly the largest ever made in the southern hemisphere.

Measuring 150 ft long by 18½-ft deep at its deepest section it weighed 100 tons. Builder was Bernard Smith (Pty.) Ltd., Sydney. It was transported in three sections to Port Kembla, New South Wales, for assembly and erection at Australian Iron and Steel Pty. Ltd's new hot and cold strip mill. The big beam will span the transfer bay and support two cranes whose combined capacity is 200 tons.

Major part of the welding was accomplished with the submerged-arc process because of the heavy welds required. The top and bottom flanges measure 3⅝-in. and 3⅜-in. thick respectively and are 27-in. wide. Web thicknesses vary from ⅝ in. in the center to ⅞-in. at the ends.

Stiffeners were made from 24 by 7½-in. rolled steel joints cut in halves. A half was welded to either side of the web plate.

—McGraw-Hill World News

* * *

Westinghouse Builds Alabama Electrode Plant

AN ULTRA-MODERN welding electrode plant will be built by Westinghouse Electric Corp. at Montevallo, Ala., 38 miles south of Birmingham. Otis O. Rae, of Atlanta, Ga., manager of the company's southeastern district, and Tom Turner, vice-president in charge of the Westinghouse Motor and Control Division, Buffalo, N. Y., revealed the plans at a press conference and luncheon for Montevallo civic and business leaders.

The one-story steel and brick structure, some 400 ft long, will be located on a 52-acre site two and one-half miles east of town on state route 25. The first welding electrode plant in the South, it will supply all of the South and the Pacific Coast states and the brazing alloys made there will be shipped throughout the country.

The new electrode plant is included in Westinghouse's $296,000,000 expansion program in answer to increased metalworking activity in the South. It will more than double the company's production capacity. Some of its production will be in the newest and latest types for the armed forces.

Although certain architectural details were not settled at year's end, officials hoped that construction would start this month with completion tentatively planned for September. If this schedule is met, full operation of the plant should be possible by early 1954.

Flame Hardening Castings

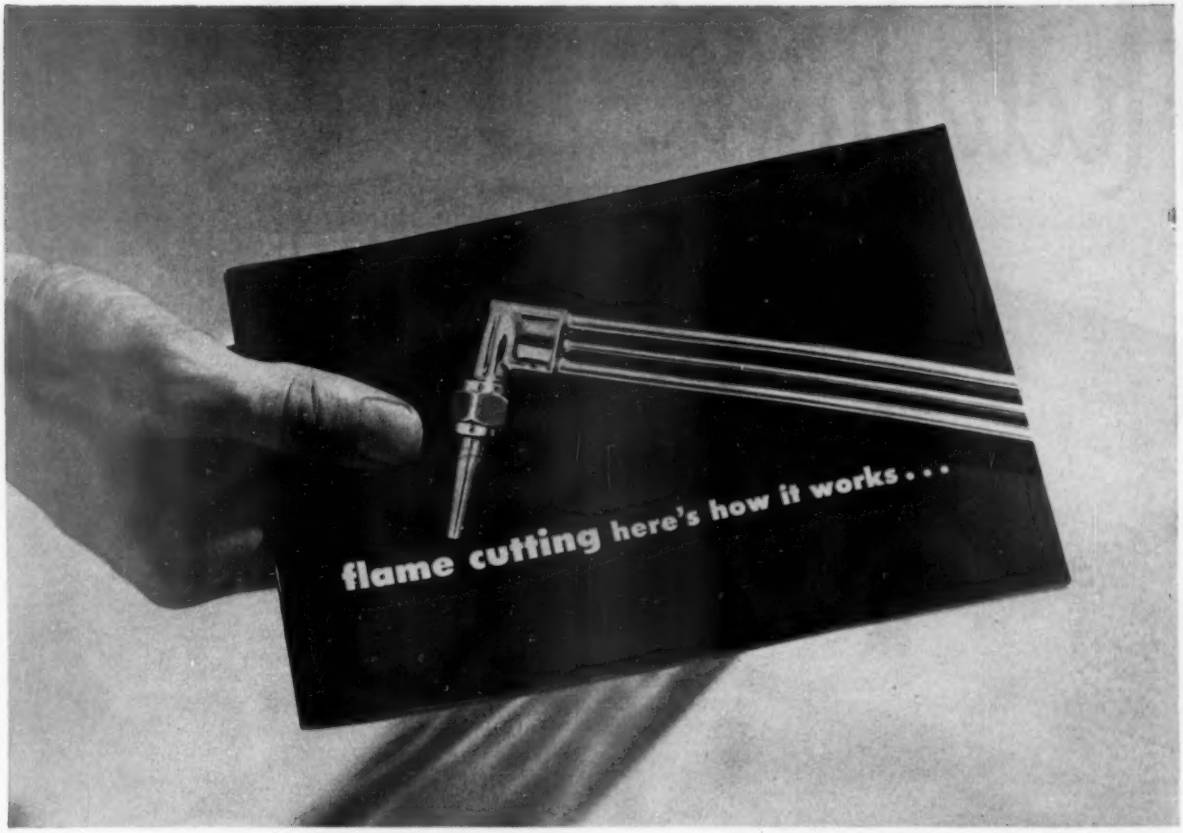
(Right photo)

WEARING life of locomotive-tender truck-center castings has been substantially increased on Illinois Central Railroad equipment because of a new flame-hardening treatment. The hardened center castings resist surface tears and burrings which formerly caused them to lock together.

Before flame-treating the castings are machined lightly to a specified diameter. Male castings are laid flat on a machine-rotated mandrel for face hardening and on the side for sidewall treatment. Inner walls of female castings are treated in this same manner. A special torch with a multi-flame head is used, according to the Oxweld Railroad Service Co. The castings are rotated at about 3½-in. per minute under the flame and immediately water-quenched.

A simple spool-drive accomplishes the rotation of the castings.

(More news on page 66)



this is a really good book, you will want a copy of it . . . free, while supply lasts

This forty page brochure is packed full of important, interesting and worth-while information; 27 fine photographs illustrate the well written text. Here are some of the subjects covered:

What is flame cutting . . . why preheating flames . . . one or many preheating flames . . . how important is the oxygen jet . . . how much oxygen pressure do we need . . . does pressure dictate volume . . . which fuel gas to select . . . and full details about how a cutting torch is designed and how it functions.

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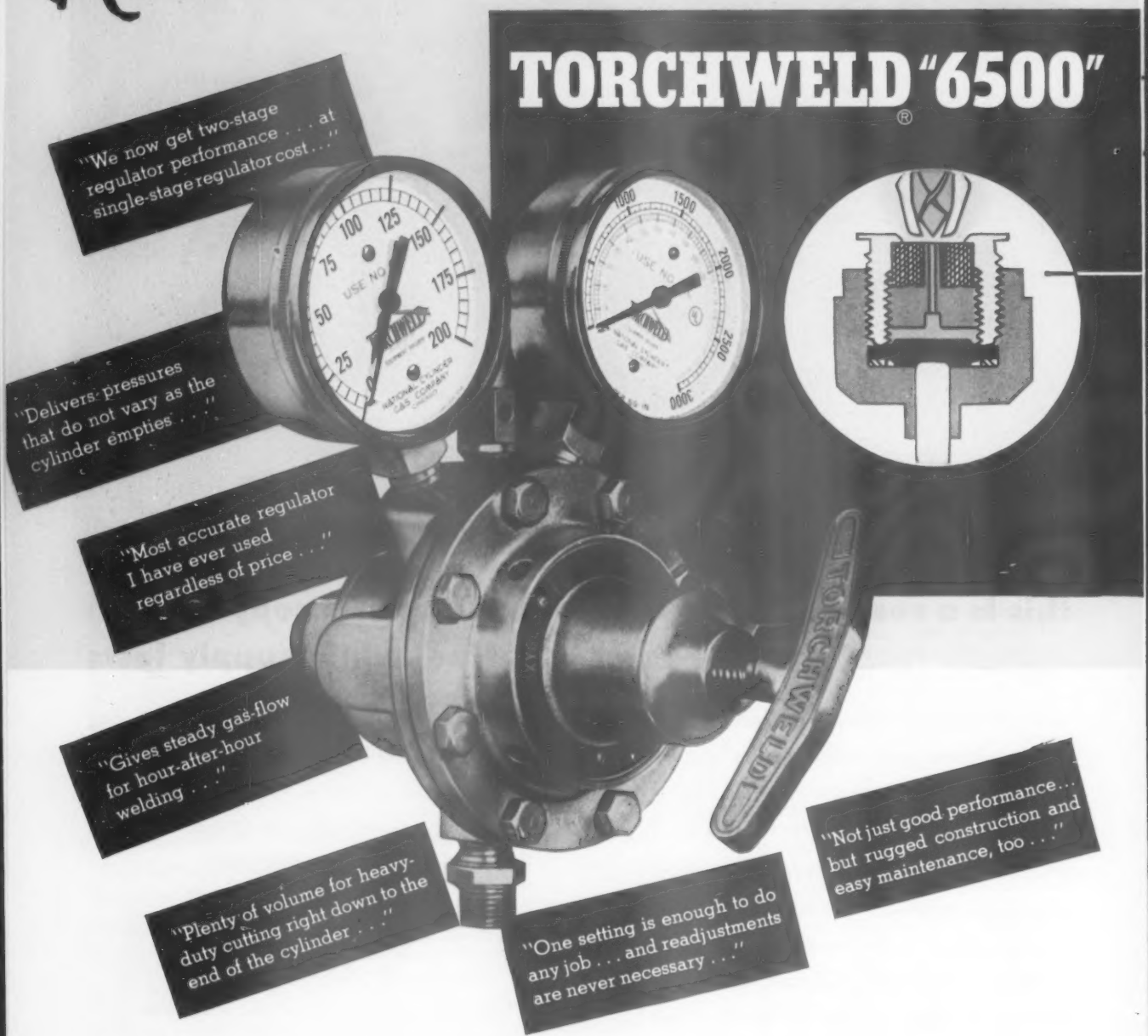
"We now get two-stage regulator performance . . . at single-stage regulator cost . . ."
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"Most accurate regulator I have ever used regardless of price . . ."
"Gives steady gas-flow for hour-after-hour welding . . ."
"Plenty of volume for heavy-duty cutting right down to the end of the cylinder . . ."
"One setting is enough to do any job . . . and readjustments are never necessary . . ."
"Not just good performance . . . but rugged construction and easy maintenance, too . . ."
TORCHWELD

Here's why Torchweld "6500" delivers constant pressure and volume regardless of cylinder pressure

In any regulator the pressure of the incoming gas is one of the forces operating the valve mechanism. As cylinder pressure drops, this force decreases, causing a variation in the volume of gas flowing through the valve.

In the TORCHWELD "6500", a pressure compensating chamber below the seat counteracts the effect of this decreasing force.

A small passage in the valve seat permits gas at *cylinder pressure* to enter the chamber. At the bottom of the chamber is a reinforced rubber sealing disk. Below the disk is a pin which rests against the back of the regulator.

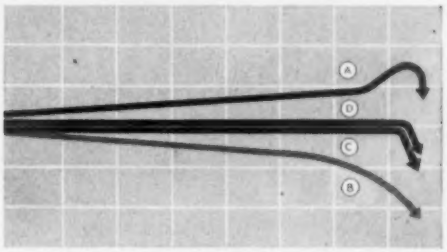
The forces within the chamber act upon the disk and pin so that there is a resultant effective force which tends to move the seat upward toward the nozzle.

As cylinder pressure drops this upward force diminishes, resulting in a gradual increase of the spacing between seat and nozzle. This compensates for the effects of decreasing cylinder pressures, and thus maintains constant delivery pressure and volume.

as truly revolutionary!

REGULATOR with pressure compensating chamber

Here's how various types of regulators act as cylinder pressure drops



Ⓐ *Stem-type* single-stage regulator delivers at *increasingly higher* pressures as the cylinder empties. Frequent pressure adjustments are necessary.

Ⓑ *Nozzle-type* single-stage regulator delivers gas at pressures that *drop lower and lower* as the cylinder empties. Frequent pressure adjustments are necessary.

Ⓒ *Two-Stage* regulator gives uniform working pressure regardless of cylinder pressure, depending upon quality of regulator. Pressure adjustments are avoided.

Ⓓ TORCHWELD "6500" REGULATOR delivers constant working pressure (whatever it's set for) regardless of drop in cylinder pressure. No adjustments are necessary to maintain desired flame characteristics.

Plants and welding shops everywhere are buying the TORCHWELD "6500" to get the best performance at the least cost

It costs only slightly more than the average single-stage regulator, but it gives the precise control heretofore available only in higher-priced two-stage regulators. That's the reason the TORCHWELD "6500" is the wise choice wherever regulators must be replaced, or new equipment ordered.

Acclaimed the first major advance in regulator design in 20 years, the TORCHWELD "6500" is a brand new *type* of regulator, combining the advantages of both single and two-stage regulation without the disadvantages of either.

The TORCHWELD "6500" delivers precise and constant working pressure (at whatever setting you choose) *regardless of decreasing cylinder pressure.* This is made possible, at a price to please every pocketbook, by the unique NCG-engineered "*pressure compensating chamber*"—an exclusive feature.

What's more—the "6500" has all the quality refinements characteristic of TORCHWELD—extra-big streamlined gas passages, exclusive "SPIREX" nozzle element that prevents seat ignition, inlet filter, relief valve, rugged construction and few working parts to wear or repair. Better write *today* for Bulletin No. NTW-104 and get *all* the details.

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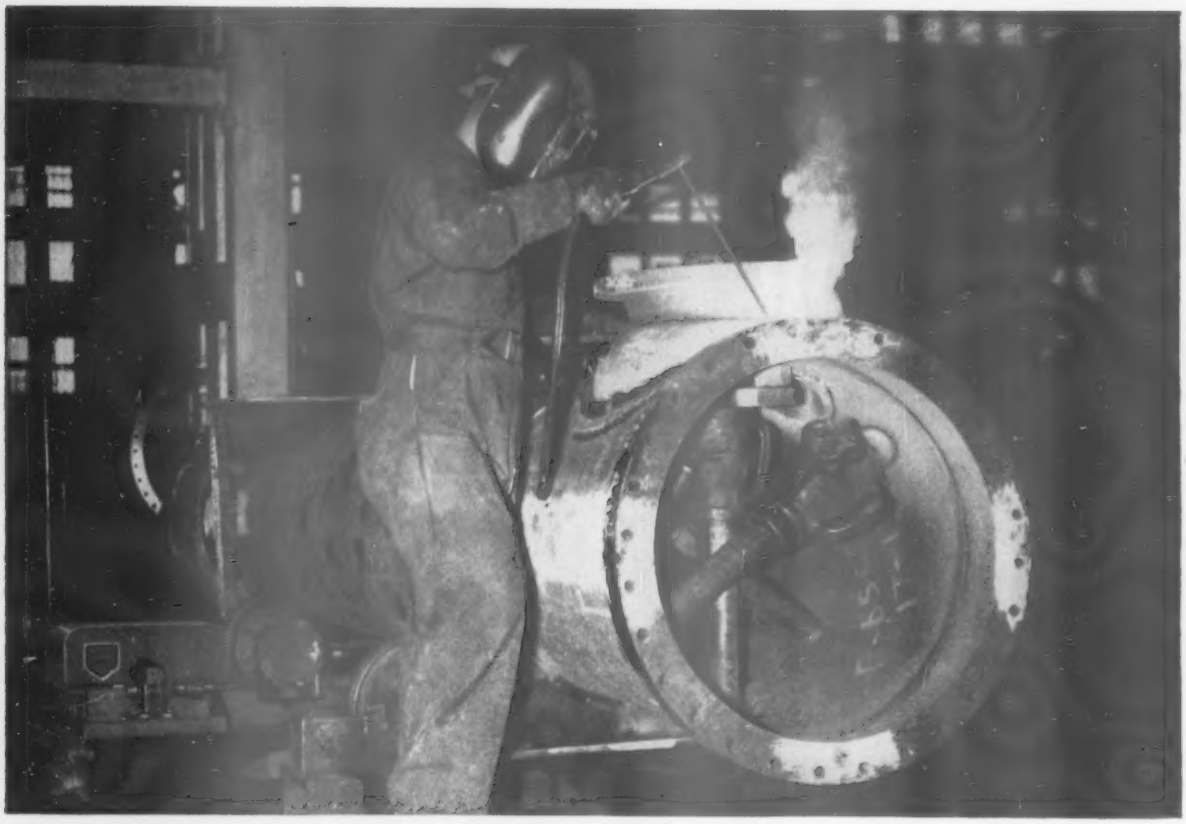

This welder can weld up to 50% more than he used to!

With Worthington turning rolls any welder can get better welds and turn out real footage

No problem to boost welding footage as much as 50% when you use Worthington Turning Rolls.

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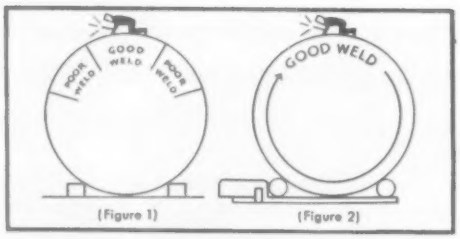
With Worthington Turning Rolls at work his footage is soaring and he produces neater, stronger welds with less effort. Now, *power* turns the vessel at any selected welding speed as he quickly spots longitudinal seams or continuously welds circumferential seams.

To find out where you can see a nearby Worthington Turning Roll, just ask us. For more data, ask for Bulletin 228. Worthington Corporation, Plainfield, N. J.



WHY WORTHINGTON TURNING ROLLS INSURE BETTER WELDS

Unless the work is turned continuously, good downhand welding is obtainable only in small area (Fig. 1). With a Worthington Turning Roll, downhand welding is assured for the complete circumferential seam (Fig. 2) as well as all longitudinal seams (either by manual or automatic welding).

Y.2.1

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Welding Positioners
Turning Rolls

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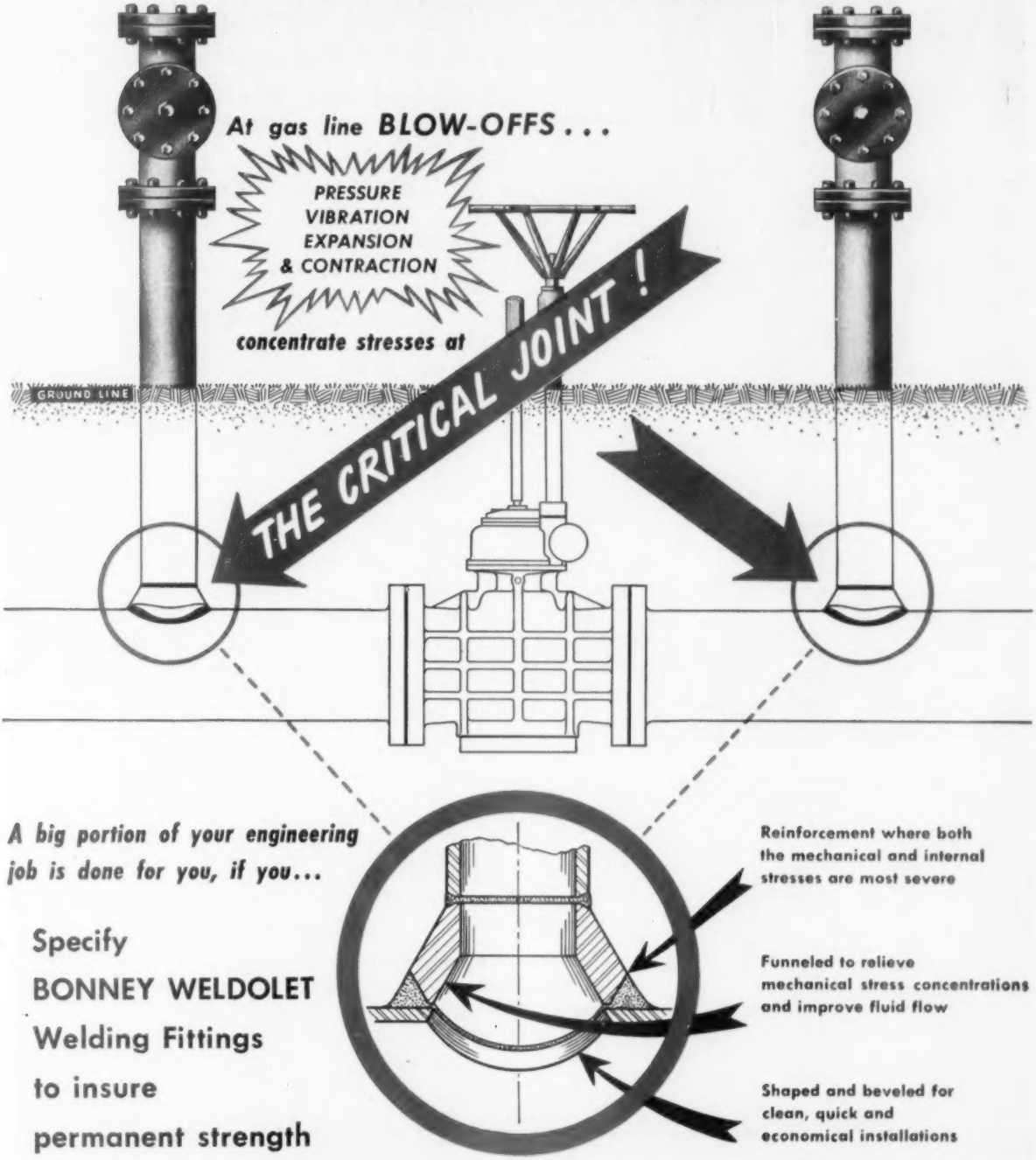
FOR YOUR BRANCH CONNECTIONS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& CONTRACTION
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THE CRITICAL JOINT !
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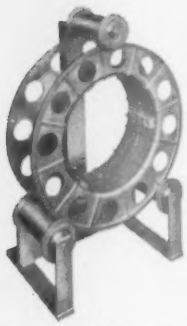
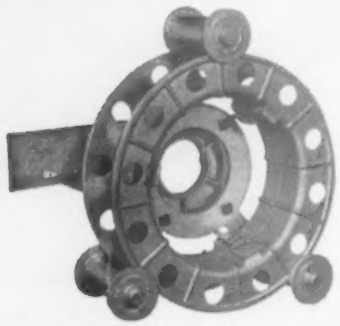
Double and Triple weight coils for automatic welding with the new REID-AVERY (free wheeling) REELS for Submerged Arc, Open Arc, and Gas Shielded Arc Welding



Raco Reel for 150-200# coils with floor mounting stand.

Decrease down-time by using larger coils. Machines now equipped for 25 lb. coils can use up to 75 lb. coils with these new reels.

These cast aluminum alloy reels ride on ball-bearing trunnions with deep flanges. The wire uncoils with remarkable ease and yet there is no chance of overrunning and throwing loops over the side. No brakes or drags of any kind are necessary. The wire itself prevents overrun. These "free wheeling" reels provide the absolute minimum load on the automatic welding machine.



Raco Reel for 25#-50#-75# coils. Mounted on popular submerged arc machine.

The Reid-Avery reels are available with stands for floor mounting or with special spiders for direct attachment to most popular automatic welding machines. Three reels 12" ID x 4" wide, 14" ID x 6" wide, and 25" ID x 4" wide nominal size are in stock for prompt delivery.

Raco Reel shown split for loading.

Note the simple split reel construction with suitcase type latches. Coils can be replaced in seconds and no wrenches or special tools are required.

We are equipped to supply all sizes of layer wound coils for these reels, for other reels, or on expendable wooden spools where required.

The REID-AVERY COMPANY

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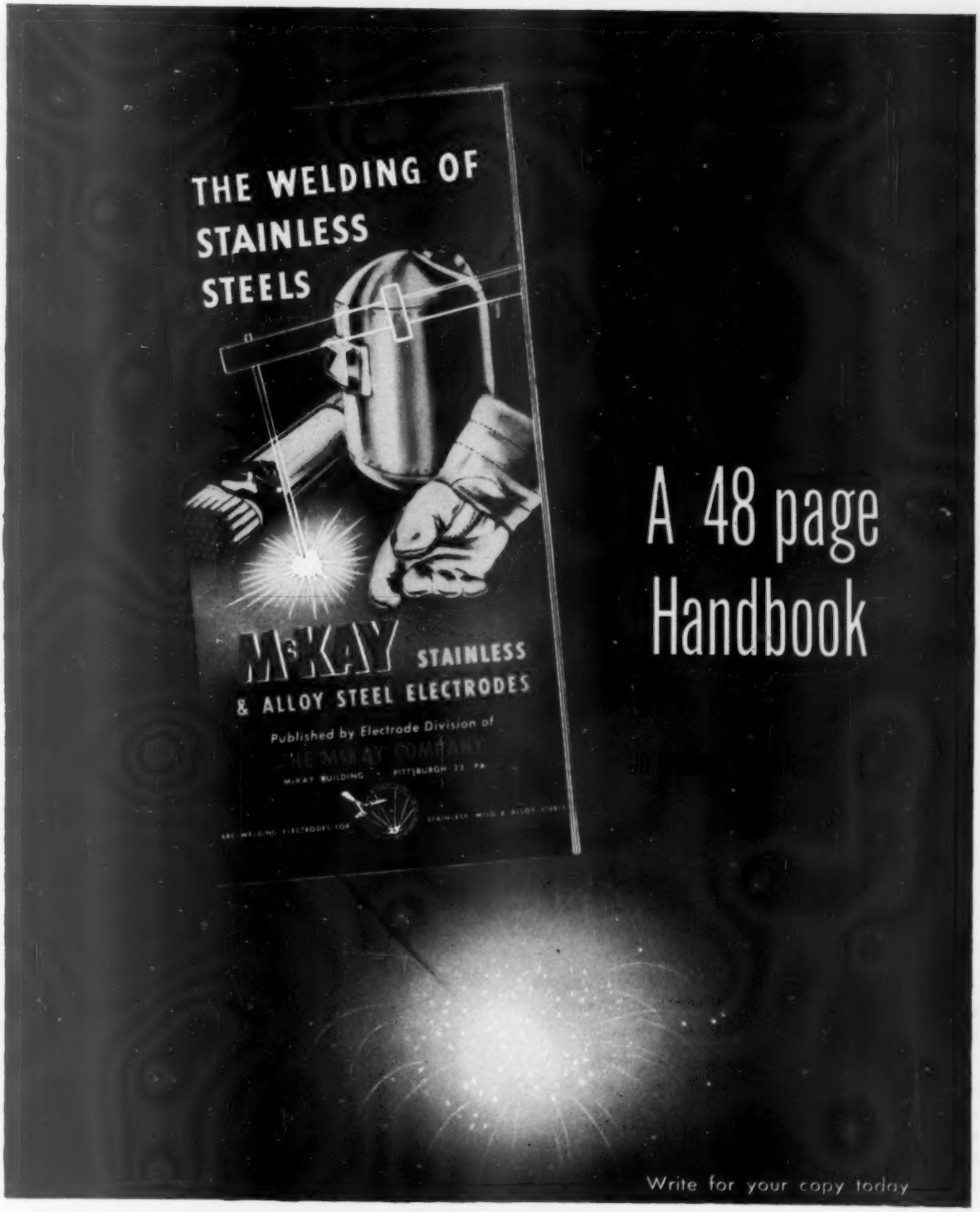
SINCE 1919 PRODUCERS OF ARC WELDING ELECTRODES AND WELDING RODS


THE WELDING OF STAINLESS STEELS
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WELDING ELECTRODES · COMMERCIAL CHAINS · TIRE CHAINS

Welding Arcs

OLD G-E WELDERS? Some have been in this salt air for ten years but they still give top performance. Through the porthole a workman feeds cable to weldors (inset) deep in the hold—sometimes as far away as 300 feet. Don't miss the new G-E a-c sets.

DEPENDABLE G-E A-C WELDERS HELP SPEED U.S. SHIPBUILDING PROGRAM

On the piers and in the shops of the nation's leading shipyards you will see a-c welding used on nearly every job.

The many corners and the flat and horizontal joints to be welded in ship construction make a-c the best method for most applications. The change from d-c to a-c welding has saved these yards hundreds of thousands of dollars.

Geared for 24-hour work on ships when fast construction or repair is necessary, these yards recognize the advantages of speedy welding with G-E a-c sets.

FAST LOCAL SERVICE is available to each yard on welding problems through the nearby G-E Welding Distributor. You, too, can get this *local* service, backed by the research, engineering and service facilities of General Electric.

When you make your swing to a-c welding, swing to G.E., pioneer in a-c welding and still the leader. For equipment, electrodes, accessories, spare parts and service, call the local G-E Welding Distributor—see list next page, or look in the yellow pages of your telephone book under "Welding Equipment—General Electric." General Electric Co., Schenectady, N. Y. 710-1

GENERAL ELECTRIC

News

information on equipment, electrodes and accessories from G.E., pioneer in a-c welding

HERE'S THE A-C SET YOU ASKED FOR

Built for dependability and easier welding . . . on suggestions from G-E customers

1. Fast range-changing with new switch—no leads to unplug, no connections to make.

2. Quick inspection is easy. Remove the entire case in two minutes without disconnecting the primary leads.

3. You save on power with a case-mounted primary switch for turning off the current between welds.

4. Fast take-offs—no scratching or pecking. Weldors save time because automatic hotstart adjusts instantly to every setting.

5. Smooth arc is easy to control because arc-stabilizing capacitors eliminate popouts.

6. Case stays cool because the large fan gives every component adequate ventilation.

7. Pinpoint accuracy in current settings is easy with the wide, double current range.

8. Long coil life and trouble-free operation are built in with Class H Silicone insulation, able to take temperatures 30 per cent higher than ordinary insulations.

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Joe Magee says . . . Here's where to use low-hydrogen rods . . .

If you're looking for electrodes to weld high alloy steel, medium carbon steel and sulphur steel without underbead cracking and porosity, G-E W-32 low-hydrogen rods are your answer. These electrodes will weld equally well on a-c or d-c, and their high ductility and toughness will hold up exceptionally well at low temperatures. G-E W-32 is an excellent trouble-shooter for production welding, and it is ideal as a maintenance tool, too. Cost-wise, it is entirely practical to replace ordinary electrodes on some applications with G-E low-hydrogen electrodes which offer higher speeds and higher impact values.

The use of low-hydrogen electrodes is especially recommended for welding plate that must be enameled. The entrapped hydrogen resulting from the use of ordinary electrodes escapes after enameling and causes flaking. The use of G-E W-32 electrodes will practically eliminate this condition and save many hours of re-working.

ELECTRODE COMPARATOR!

Now it's easy to switch to G-E electrodes. AWS classification and competitors' numbers available for 23 G-E stainless steel and 36 regular G-E electrodes on sturdy pocket-size slide-rule.

Available *only* through your G-E Welding Distributor. Ask him for one today!

See your nearby Welding Distributor—

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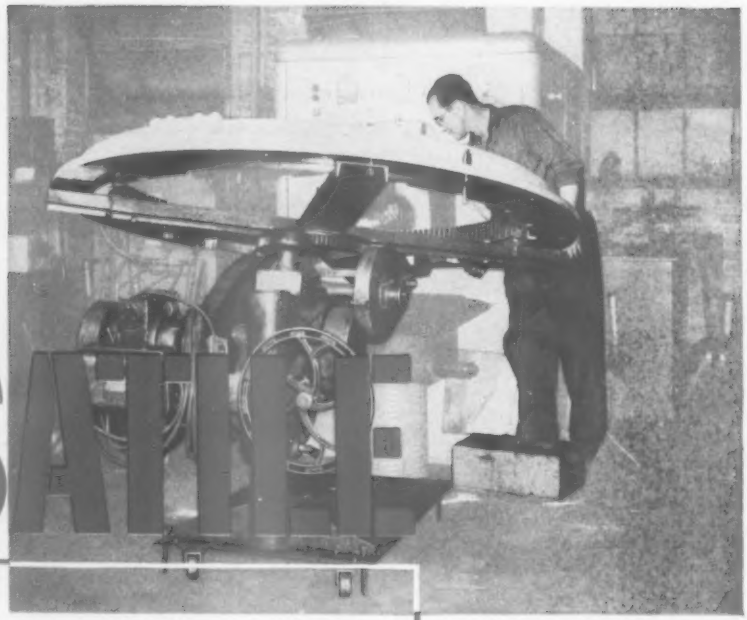
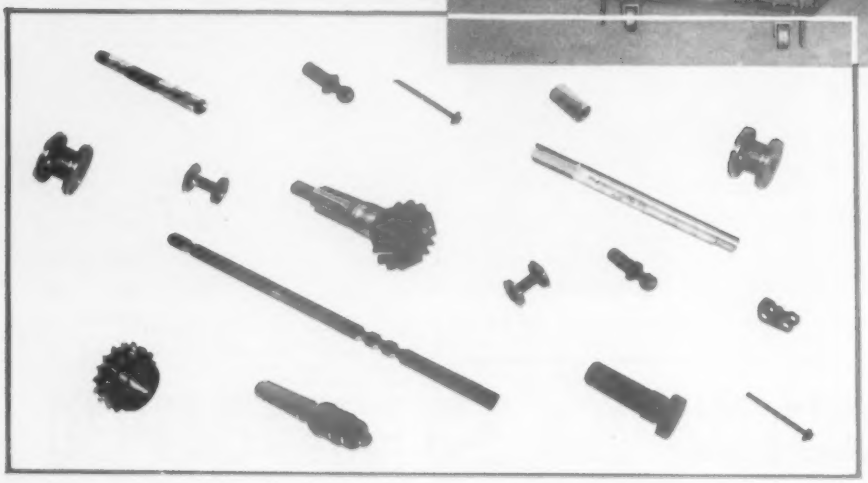
VERSATILE



"Internal ring gear being hardened on the Lindberg LI-25 Induction Heating Unit".



Investigate the amazing versatility of the Lindberg Induction Heating Unit—approximately 2000 different parts have been selectively hardened or annealed on this typical commercial heat treating installation.

FROM THE LARGEST—The internal ring gear illustrated above—with a 60" inside diameter, 3½" face with 187 teeth each individually heated and oil spray quenched.

TO THE SMALLEST—This small 2" stamped metal rocker arm was selectively heated and water quenched on the small square face at the rate of 3000 per hour. Investigate this versatile Lindberg Induction Heating Unit—it may supply the answer to your selective heating operations.

SPECIFY LINDBERG

for any heat treating or melting need! Lindberg manufactures every type and many sizes of melting and heat treating furnaces from tiny laboratory units to mammoth field erected installations—whether it's gas, oil, electric, arc, low or high frequency—consult your local Lindberg Office!

LINDBERG
HIGH FREQUENCY DIVISION

LINDBERG ENGINEERING COMPANY 2447 W. Hubbard Street, Chicago 12, Illinois

Remember — the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Engineered

FOR MINIMUM PRESSURE DROP

THIS TUBE-TURN Welding Elbow has full radius conforming to A.S.A. Standard B 16.9. The radius is not reduced by tangents. The interior walls are consistently smooth and perfectly circular . . . important production features which minimize pressure drop.

This attention to engineering detail pays off in your piping systems. When you specify TUBE-TURN Welding Fittings and Flanges, pressure drop is at a minimum and uniformity of fit-up is assured.

You'll find a TUBE TURNS' Distributor in every principal city. Call him for good service in good connections.

Be sure you see the double "tt"

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

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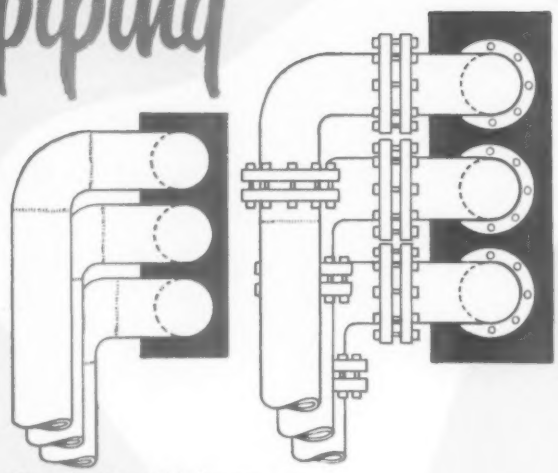
COMPACT WELDED PIPING SIMPLIFIES THE JOB

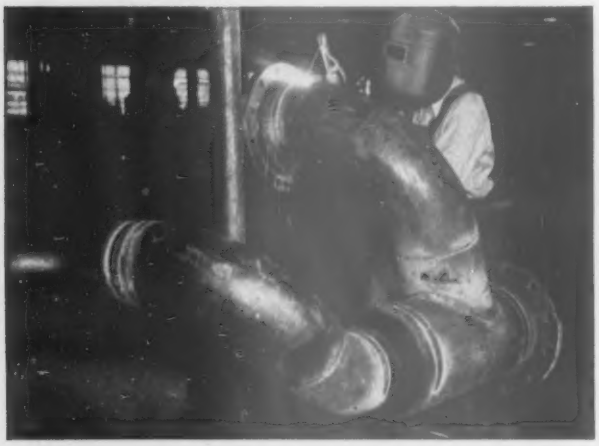
COMPACT *Welded piping* SIMPLIFIES THE JOB

You can simplify design, save valuable space and speed up the piping job by specifying *welded construction* with Tube-Turn Welding Fittings. Welded joints are virtually flush with the pipe. Pipes can fit snugly together in tight corners . . . against wall or ceiling . . . or around equipment. And welded piping requires little elbow room to install . . . and to insulate. The true circularity and uniform wall thickness of Tube-Turn Welding Fittings simplifies fit-up and assures a job well done under crowded working conditions.

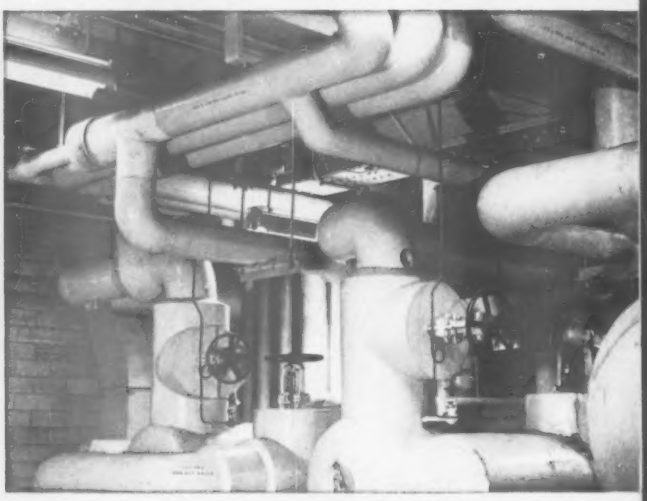
This is just one reason why it pays to specify *welded piping*. It's stronger, lighter, streamlined, economical to install, insulate and maintain.



Example: The welded assembly on left takes a third less space than comparable flanged assembly.



Bring on your tight corners! Entire sections of welded piping can be shop-fabricated and erected as a unit with a few simple tie in welds or flange connections to valves or containers.



In the new O. H. Hutchings Station of Dayton Power & Light Company. Piping for deaerators and feed water heaters is compact, streamlined and permanent. Directional changes are made with TUBE-TURN Welding Fittings.

Want Dimension Data?

Tube Turns, Inc. has compiled a handy folder of charts covering dimensions and weights of TUBE-TURN Welding Fittings and Flanges. If you'd like a free copy just send this coupon.

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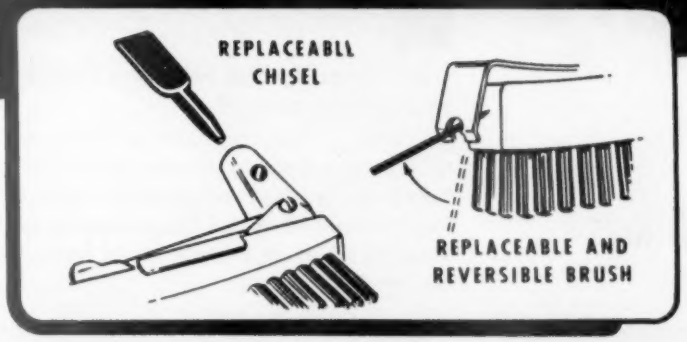
THE MOST PRACTICAL WELD CLEANING TOOL EVER DESIGNED!



Model B-1
(With wood handle, B-1W)

Atlas "RE-BIT DUAL TOOL"

● Experience real economy with this tool that requires replacement of worn parts only! The "Re-bit" chisel can be set at any angle, has a wider edge and narrower cross section, gets into corners and pockets better, affords better vision. "Re-bit" is easier to sharpen, lasts longer . . . Ask your welding supply dealer for information on all 27 Atlas models.

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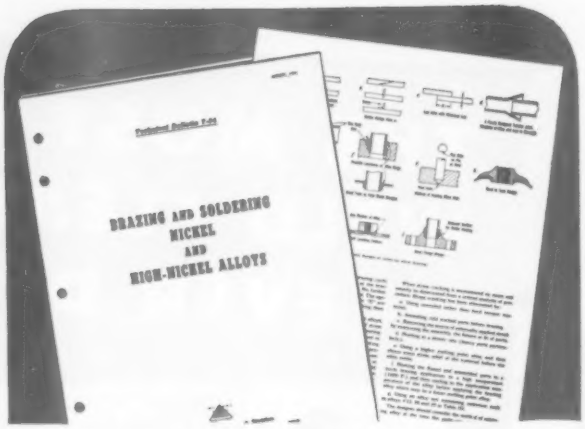
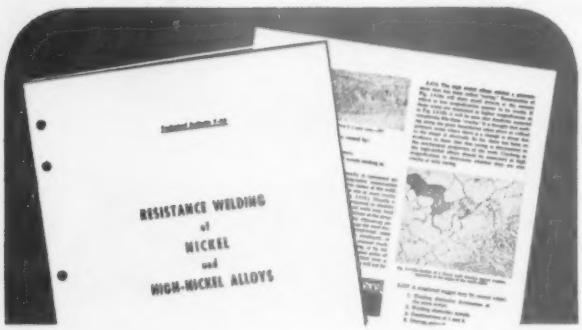
Now you can have a *Complete Library*

on welding Nickel and High-Nickel Alloys



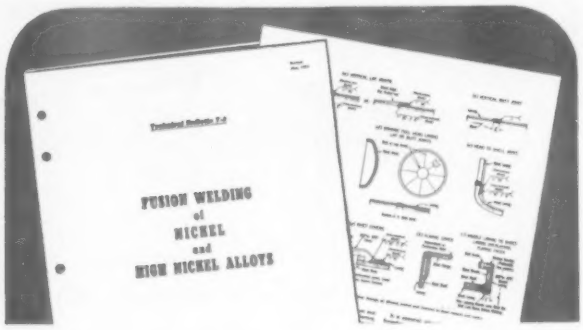
T-34, "Brazing and Soldering Nickel and High-Nickel Alloys"

This is the newest welding publication from Inco's Technical Service Section. It covers design, surface preparation, fluxes, heating methods, post brazing treatment and inspection for silver and copper brazing. It also contains valuable tables on properties and formulae and a section on soft soldering.



T-33, "Resistance Welding of Nickel and High-Nickel Alloys"

T-33 covers design and equipment considerations, welding procedures (both for similar and dissimilar metals), checks for defects and tests for spot, seam, projection and flash welding. It also covers resistance brazing. It gives tables on chemical analysis and mechanical and physical properties, and recommended conditions for welding. The text is amply illustrated with valuable diagrams and photographs.



T-2, "Fusion Welding of Nickel and High-Nickel Alloys"

T-2 covers surface preparation, joint designs, jigs and clamps, electrodes, current, pre-heating, flux and welding procedures for metal arc and gas arc welding. It discusses overlays on cast iron and joining of dissimilar metals; and the preparation, application and testing of linings. It contains tables of chemical analysis and mechanical and physical properties and electrode requirements. Like T-34 and T-33, it is heavily illustrated with diagrams and photographs.

Inco's Technical Service Section wants you to have all three of these bulletins to complete your library on the most up-to-date welding techniques. There is no charge for them. Write today for T-34 and if you don't have T-33 and T-2 ask for them, too.

Consult your Distributor of Inco Welding Materials for latest information on their availability. Remember, too – it always helps to anticipate your requirements well in advance.

EMBLEM OF SERVICE INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

ESTABLISHED 1916

THE WELDING ENGINEER

FEBRUARY, 1953

A Black Eye for Welding

AT LEAST ten million dollars' worth of buildings and equipment has been burned up in the last few months because those in charge of flame-cutting operations were too lazy to plan their jobs. Here's one example:

Last month I visited a supposedly fireproof plant just two days after a roofer had been around. I am still wondering if the roofer will get paid for his work. He didn't do very much—except burn the place down!

Part of the job was to remove sheet-metal roofing from a sheet-metal building 100 by 300 ft. Flame-cutting was selected as the quickest way of doing it, but the preliminary step of looking around to see where the sparks might go was skipped. The sparks fell on packing boxes, excelsior and grease-coated machine parts, and a hell of a hot fire resulted. Enough heat was created to cause the collapse of the sheet-metal walls of both the building where the fire started and the similar "fireproof" building next to it.

Manufacturers of oxacetylene equipment have spent fortunes in making their products almost foolproof. Acetylene cylinders, for example, are now made so that they won't explode even when you build a bonfire around them. Yet any careless weldor or flame-cutting operator can nullify the built-in safety features by simply directing the "hottest flame on earth" on inflammable materials.

BESIDES damaging valuable property, such fires mean bad newspaper publicity. Everyone of them is a black eye for welding. Brother, welding has been given too many black eyes!

Management, also, must shoulder its share of the blame. Only recently, I read of a plant where it was the practice to store paints in a room next to the welding shop. As if that wasn't enough, connecting doors linked the paint room and weld shop. Can you guess what happened?

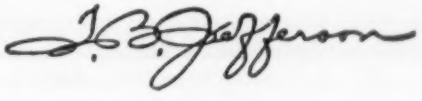
The paint room door was left open once too often. Lacquer fumes drifted into the weld shop, and there was an explosion! Two weldors—both innocent victims—were badly burned, and a large industrial plant was burned to the ground. The newspapers blamed welding, of course, when it was really the safety engineers and plant manager who were at fault.

In the case of the plant set afire by the roofer, the roofing contractor and his employees were primarily to blame, but the safety engineer should have been around to look at things. He should not have allowed flame-cutting to be undertaken in so hazardous an area.

THE PREVENTION of fires is everybody's business—from the night watchman up to and including the chairman of the board. Management, safety engineers, welding and cutting operators and all other plant personnel must shoulder their ends. Here are a few simple rules (courtesy of the International Acetylene Association) that everybody in the plant should know by heart:

1. Never use cutting or welding torches where sparks or an open flame would be a hazard.
2. Before you cut or weld in a new location, check with the nearest foreman or superintendent to see if he knows of a fire hazard that you might fail to guard against.
3. If cutting is to be done, materials that burn easily should be at least 30 ft from the torch.
4. Use sheet-metal guards, asbestos paper, asbestos curtains or something fireproof to keep sparks close to the work. Do not use tarpaulins!
5. Sweep floors clean before you light the torch. Wet down wooden floors.
6. See that the hoses for oxygen and acetylene are guarded against possible injury. Acetylene escaping from a broken hose line can easily start a disastrous fire.
7. Do not weld or cut on tanks that have held gasoline or other flammable liquid without taking special precautions. If you do not know what precautions to take, ask the International Acetylene Association, 30 East 42nd St., New York 17, N. Y.
8. Be ready to put out any fire promptly. Fire extinguishers, water hose or pails of water and sand should be ready for instant service.

Let's make 1953 the safest year yet for welding!



Prove to yourself that
You Can Get More Welds Per Dollar

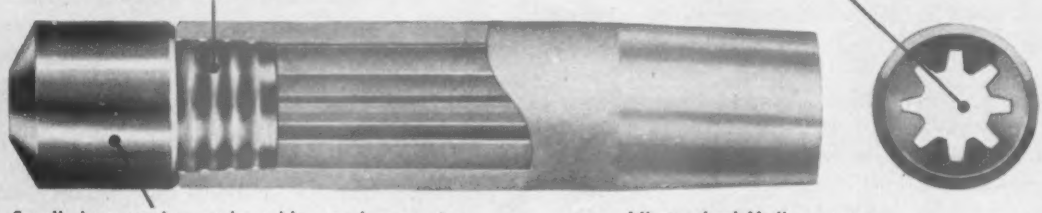
How? Give your Mallory distributor a call and ask him to drop by with some of our replaceable "Nu-Wrinkle Cap"* electrodes for you to examine. Have him leave a few for you to try out in your shop. Then you'll see what we mean when we say "more welds per dollar".

Nearly two years of experience in shops all over the country has proven that the performance of Mallory "Nu-Wrinkle Cap" electrodes compares favorably with that of conventional one-piece electrodes . . . in addition to reducing unit costs. Time after time . . . experience has shown that with good welding practices, many manufacturers have effected substantial savings by using 20 to 25 "Nu-Wrinkle Cap" electrodes before replacing a shank. As a matter of fact, one manufacturer used 75 caps on a single shank.

HERE IS WHAT THEY LOOK LIKE . . .

Corrugations in shank insure effective mechanical attachment and positive electrical contact.

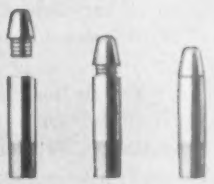
Fluted water holes assure rapid heat transfer . . . maximum cooling.



Small, inexpensive replaceable cap is easy to insert and remove from the fluted reusable shank.

All standard Mallory nose shapes are available.

HERE IS HOW THEY WORK . . .



"Nu-Wrinkle Caps" seat easily and securely in the shank. Under normal welding pressures they are seated by the operation of the welding machine.

The cap can be quickly and easily removed with special Mallory pliers that are designed to remove caps from both No. 1 and No. 2 Morse taper shanks.

Along with "Nu-Wrinkle Cap" electrodes, your Mallory distributor carries a complete stock of standard Mallory welding supplies for your convenience. It is another one of the ways you can . . .

Expect more . . . Get more from **P. R. MALLORY & CO. Inc. MALLORY**

In Canada, made and sold by Johnson Matthey and Mallory Ltd., 110 Industry Street, Toronto 15, Ontario.

RESISTANCE WELDING ELECTRODES, HOLDERS, DIES, RODS AND BARS, CASTINGS, FORGINGS

*Trade Mark, Patent Pending

P. R. MALLORY & CO. Inc. **MALLORY**

SERVING INDUSTRY WITH THESE PRODUCTS:

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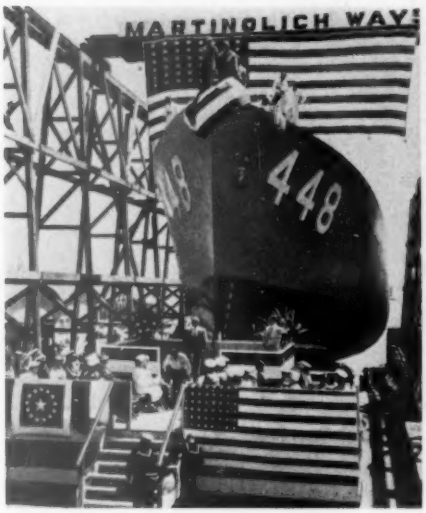
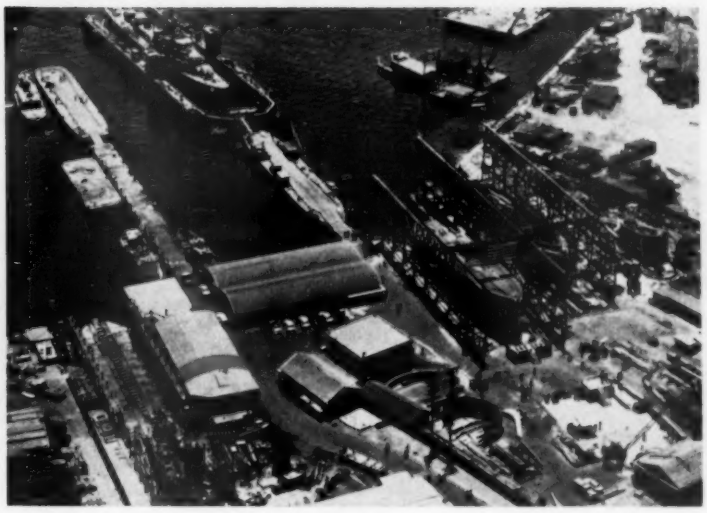
For information on titanium development, contact Mallory-Sharon Titanium Corp., Niles, Ohio





Steel won't be magnetic on this

Non-Magnetic Ship

When the minesweeper USS *Illusive* slid down the ways into San Diego bay, the splash may have dampened spirits in the Kremlin. For this was no ordinary launching. It marked the completion of the first of a new class of minesweeper that constitutes America's answer to magnetic mines

BY L. G. STEVENS
National Cylinder Gas Co.

MAGNETIC mines are made to explode when a ship passes over them. The Navy's answer is wooden-hulled ships having all metal parts and fittings made of non-magnetic alloys. Such ships can steam into a magnetic mine field with immunity and sweep a safe path for other vessels.

The builder of the first wooden-hulled minesweeper, the USS *Illusive*, is the Martinolich Shipbuilding Co., San Diego, Calif., which specializes in wooden ship construction. Shipbuilding is a Martinolich family tradition. Anthony Martinolich, the president, is a son of John Martinolich, who began building ships in Tacoma at the turn of the century. John's father in turn was a shipbuilder in Trieste, Italy. In the United States, the Martinolichs have built well over 300 vessels, including many fast tuna clippers.

At the present time, the attention of the Martinolich yard is centered upon the rapid completion of more minesweepers for the Navy. Within five minutes after the launching of the *Illusive*, the Douglas fir keel of a sister ship was being laid.

No Steel Parts

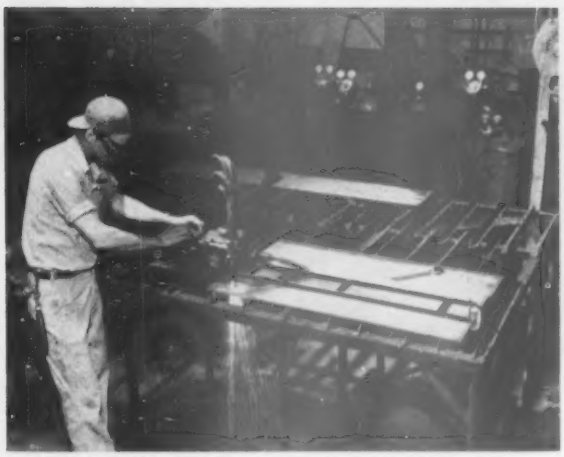
The construction of the *Illusive* posed unusual problems. Consider how common is steel in a modern ship. Yet steel is a magnetic substance and simply could not be used anywhere. This meant that every metal object—from the engines to the fans in the cabins—had to be specially built of a non-magnetic metal or alloy.

Iron does have a non-magnetic form that is known as austenite. Austenite begins to form from ferrite—magnetic iron—when pure iron is heated to 1,652 F. As carbon is added to form an iron-carbon alloy (steel), the transformation temperature gradually lowers until a minimum of 1,333 F is reached for an alloy containing 0.87% carbon. No plain-carbon steel can exist in the austenitic form at a lower temperature than 1,333 F. By adding an appreciable percentage of nickel, however, the austenitic or non-magnetic structure is retained at ordinary temperatures.

That is why chromium-nickel stainless steel is known as austenitic stainless steel. The presence of nickel in amounts from 6% upward is necessary to retain the austenitic structure at room temperature. Straight-chromium stainless steel is not austenitic but ferritic and hence magnetic.

In the building of the USS *Illusive*, the fabrication of engine mounts, tanks, etc. called for the widespread use of austentic stainless steel. There was a variety of tanks to be made: storage tanks to hold Diesel fuel (1,000-4,500 gallons) and fresh water (500-1,000 gallons) as well as smaller tanks for other purposes.

To make these tanks, it was necessary to cut stainless alloy sheets 5/32 to ½ in. thick to exact dimensions in a great variety of sizes and shapes. Conventional oxyacetylene cutting was impractical. The chrome and nickel that make stainless steel what it is are the very elements that render ordinary flame-cutting ineffective.



1—FOREMAN Charles Loftis starts a powder cut. Ordinary flame-cutting wouldn't work on stainless steel

2—CYLINDERS are for preheat oxygen, Nyrogen (to convey powder to cut), cutting oxygen and acetylene

Powder Cutting Does It

This cutting problem has been satisfactorily solved by several different methods.* At Martinolich, it was met by using powder cutting. The powder-cutting process injects a finely divided ferrous powder into the cutting-oxygen stream.

The reaction between the ferrous powder and the oxygen generates an intense supplemental heat, which melts the refractory chromium and nickel oxides as fast as they are formed. Furthermore, the molten iron oxide that is formed by this reaction acts as a flux for the refractory oxides, diluting them into highly fluid slag. Thus the cutting proceeds without resistance. Preheating (except by the regular preheating flames) is not required.

For plate of the same thickness, the cutting speed on alloy steel with the powder-cutting process is slightly slower than the speed of flame-cutting a mild-steel plate. Nevertheless, the powder cutting is plenty fast. Charles Loftis, welding foreman, states that he can make cuts at a rate of up to 3 fpm in cutting 3/8-in. 18-8 stainless. This is a much faster speed than the more conservative figure claimed by the equipment manufacturer. Mr. Loftis uses a machine cutting torch with a tip of No. 62 drill size, which is mounted on a portable flame-cutting machine.

Figure 1 shows the cutting set-up. The four hoses to the torch carry preheat oxygen, high-pressure oxygen, acetylene and ferrous powder. The preheat gases and cutting oxygen pass through the cutting tip in the usual manner, but a special adapter-sleeve assembly is needed to convey the powder to the tip and direct it into the cutting-oxygen stream in a controlled direction.

"Nyrogen" Conveys Powder

While dry compressed air is the common vehicle for conveying the powder from the dispenser hopper to the cutting tip, Martinolich has used both nitrogen and "Nyrogen" gas. The latter is a non-combustible gas mixture specially developed for this process. Its use is said to promote maximum flaking of slag, insuring clean, accurate cuts that require a minimum of clean-up work.

Figure 2 shows the various supply units. Left to right are: preheat oxygen, Nyrogen (hose to the powder dispenser in center), high-pressure oxygen and acetylene. A compact, portable outfit may be made up by simply placing the Nyrogen tank and dispenser on an ordinary two-wheel cylinder truck.

An automatic powder control unit is used. This is shown on the cylindrical container for the ferrous powder, located in the center of Fig. 2. An ejector and powder control valve, preset before the cutting starts, disperses and regulates the rate of flow of the powder. Powder flow starts and stops when the cutting oxygen is turned on and off. The dispenser hopper has a gastight, clamped-on cover and a built-in screen to break up possible lumps in the powder.

Plywood patterns or templates are made for all parts to be cut and welded. These are used for layout scribing (marking) and for postcut and postweld dimensional checks. After powder cutting has been completed on a part, the small amount of slag produced is chipped off with a hammer. The cut edge is then ground smooth with a portable electric disc sanding machine (Fig. 3). The abrasive disc is silicon-carbide, Nylon-reinforced.

Assembly and Welding

The different cut-to-specifications pieces of the tanks and other products are assembled on welding tables and tack welded together. Manual arc welding is used for both tack welding and finish welding. In Fig. 4, Welding Leadman Bernie Nolan (left) assists in the early stages of assembly of an engine base, a job for two weldors.

The large angular tanks are assembled upside down. Stiffeners are welded to tank plates before assembly. First step in assembly is to tack inner plates, gussets and wash plates to the top plate. The assembly then proceeds until all but one plate of the shell is in place. A weldor then goes into the tank through the open side to do the final inside welding. He is still inside when the last plate is applied but is able to escape through

*See "Better Cutting on Stainless Steels," "The Welding Engineer, October, 1952, page 60.

3—EDGES of cuts are ground with an electric grinder using an abrasive disc

4—TACK welding an engine base in early stage of assembly. Welding Leadman Bernie Nolan (at left) gives aid to the crew of two weldors

an access hole after the last weld has been made. Upon completion of welding, the tanks are given an air test at 10 psi, followed by another 10-p.i test with light oil, for detection of possible leakage.

Not all of the tanks are of stainless steel. In Fig. 5, the first three tanks are Monel fresh water tanks, while the tank visible in the rear is a lube oil tank of aluminum bronze.

Both the flame-cutting and the welding are done in a 45 by 140 ft shop that is spanned by a bridge crane carrying a 5-ton electric hoist. John Humphreys, machinery superintendent, is in charge. Working under "Big John," as Humphreys is affectionately known, are 35 certified weldors. In training these men to weld the stainless and other special alloys used in minesweepers, Humphreys, who has had decades of experience in diverse welding, didn't let them become perturbed. His instructions were simple but successful. He merely had the men practice on scrap pieces to get the right current setting.

Construction of each minesweeper proceeds rapidly and with clockwork precision. The component parts are built up ahead of time and applied successively as they are needed. The yard has a personnel of 750 (at this writing), soon to be increased to about 1,000.

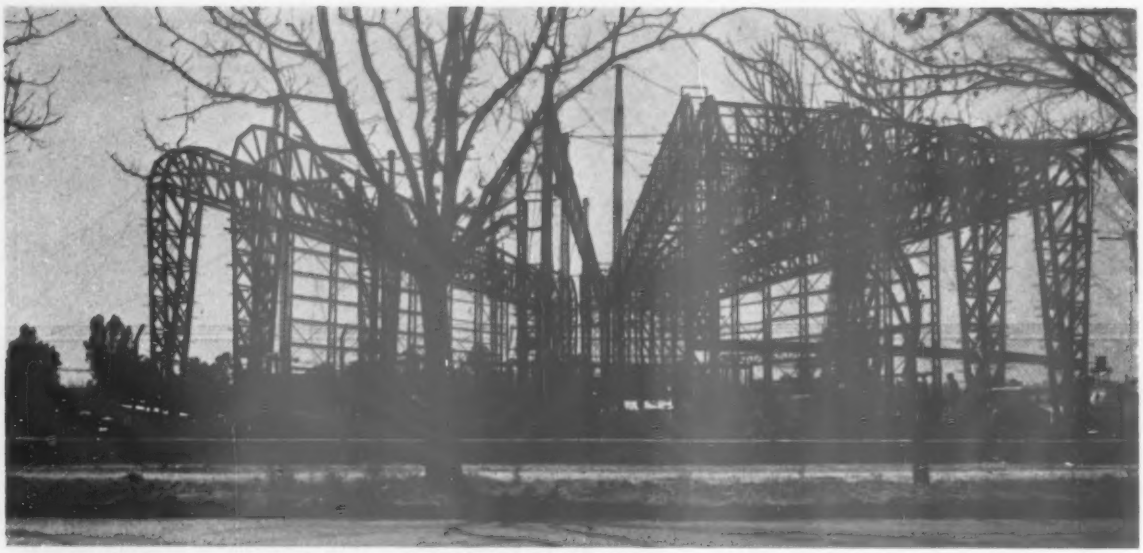
Contracts for non-magnetic minesweepers were let by the Navy in three flights, with the Martinolich contract in the second flight. Nevertheless two minesweepers built in the Martinolich yard, the *Illusive* and the *Impervious*, were the first to be launched. Work on other sweepers had been going on for 11 months before Martinolich got into action, an impressive commentary on construction methods at this yard.

Besides construction of the minesweepers, outfitting and overhaul work on various vessels is currently being carried on. A 1,000-ton marine railway is long enough (398 ft) to handle two ships at a time. Overhaul and repair work is also done in a 2,800-ton floating drydock 260 ft long.

Welding and flame-cutting equipment at Martinolich includes about a hundred 200-amp arc welders and 60 oxyacetylene outfits with all types of cutting and welding torches. The powder-cutting equipment was supplied by the San Diego Welders Supply Co.

Besides President Anthony Martinolich, other key men in the organization are: John A. Martinolich (son of Anthony) vice-president; John D. Martinolich (brother of Anthony), hull superintendent; C. R. Martinolich (brother of Anthony), outside superintendent; Newell Morris, secretary-treasurer; Marvin Tucker, general superintendent; S. E. McCarty (rear admiral, USN Ret.), director of public relations and outfitting superintendent, L. A. Bell, chief engineer; John Humphreys, machinery superintendent, and Robert J. Hubon, purchasing agent.

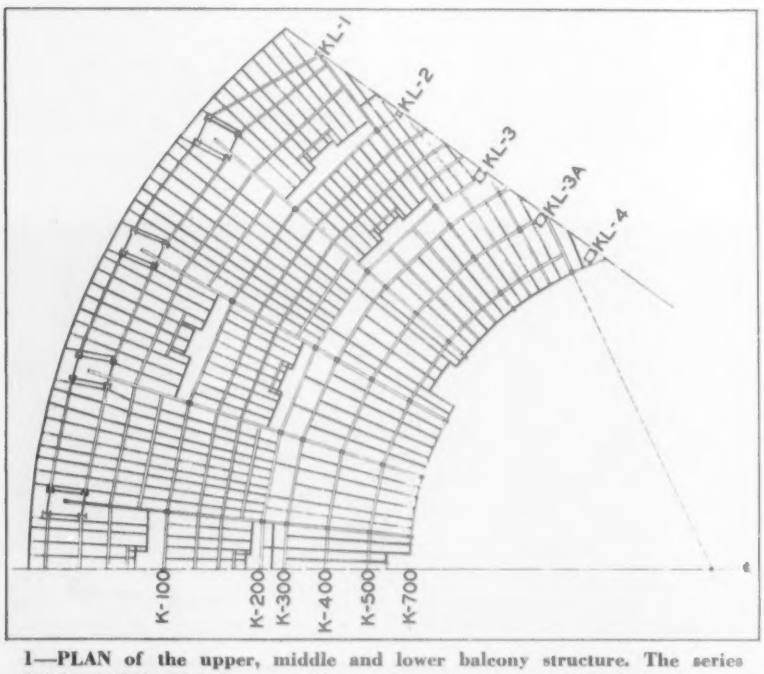
5—S. E. McCARTY (left), dir. public relations; John Humphreys (right), machinery supt., and Bill Pickett (center), of San Diego Welders Supply.



FRONT of the new municipal auditorium at Mexico City, showing the radial supporting trusses. These are welded steel members. Spans vary from 328 ft (100 meters) for the two central trusses to 294 ft for the two end ones

Mexico Claims World's

Mexico City auditorium has an unusual layout. From the air it looks like a big wedge of pie with a central angle of 107 deg. Eight rigid-frame trusses radiate symmetrically to carry the load of the roof and balcony.



1—PLAN of the upper, middle and lower balcony structure. The series K-100, K-200, K-300, etc. indicates the columns on which balcony rests

BY GUILLERMO S. POLANCO
Chief, Dept. of Engineering, Macomber de Mexico, S. A.

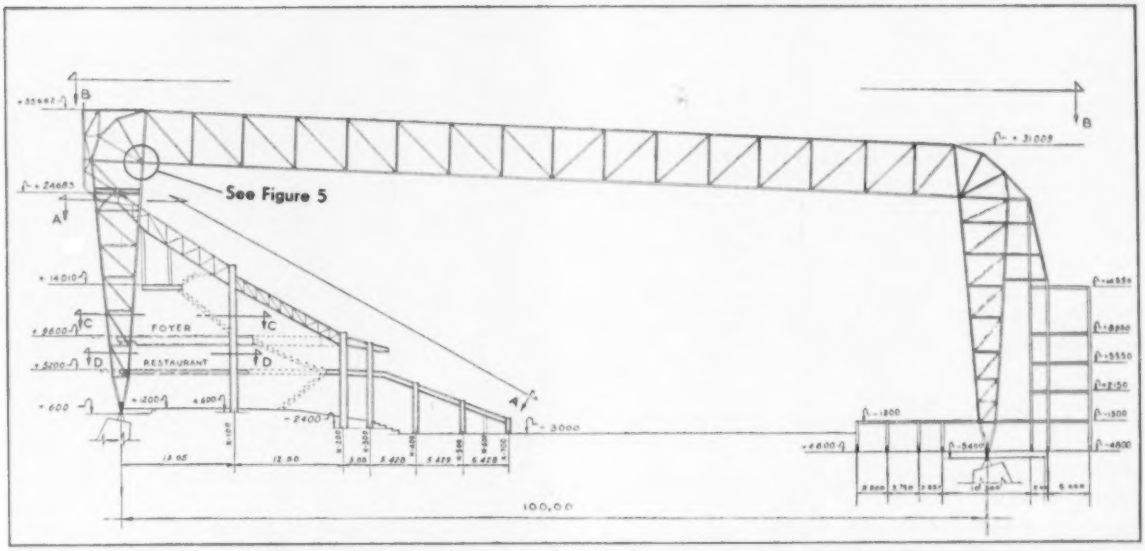
THE NEW 100,000 sq ft municipal auditorium at Mexico City is a welded structure, having what are said to be the longest welded steel spans in the world. The longest spans, completely welded trusses, have an overall length of 328 ft. The auditorium, the largest in Mexico, will be able to hold 18,500 spectators for sporting events and other attractions.

The new auditorium is being built in the Campo Marte of Mexico City in a spot that was formerly used for polo games. The plan has the form of a very big wedge of pie, with a central angle of 107 deg, a radius of 294 ft and a circumference of 548 ft.

The contract for the steel framework, including design, fabrication and erection, was given to Macomber de Mexico, S. A., a firm specializing in the building of welded structures. Among factors affecting the design of the structure were:

It was built strictly according to architectural plans, without changing any of the spans, heights, etc.

The time for designing, fabricating and erecting was very short—approximately 18 months.



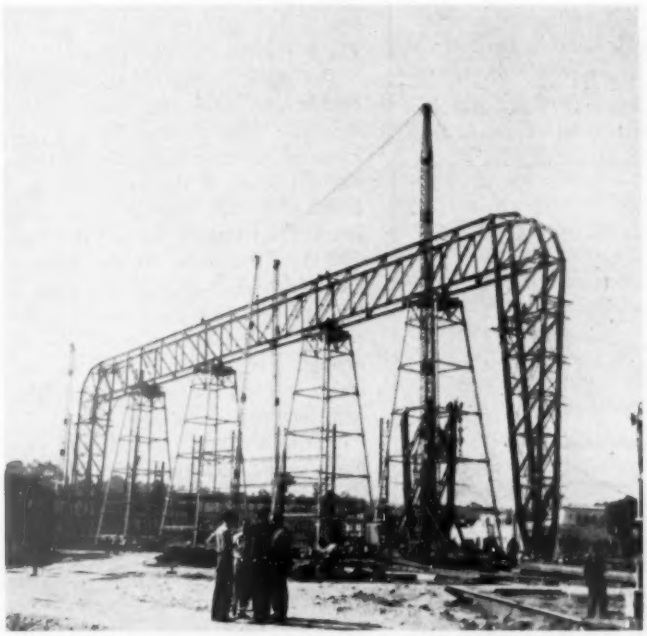
2—DRAWING shows triangulation of radial supporting truss. Circle indicates location of the knee joint, a highly complex welded joint (details in Fig. 5 on page 28). The dimensions on the diagram are given in meters

Longest Welded Spans

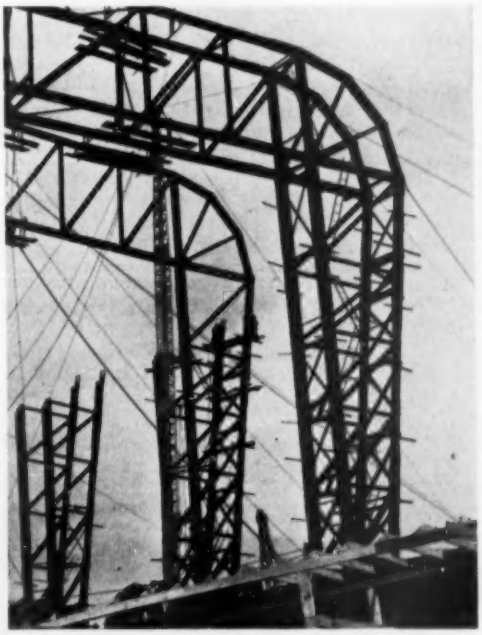
Approximately 5,000 tons of 100% Mexican steel were used. This "Monterrey" steel presented a design obstacle because of the small number of steel shapes rolled. The only steel shapes available were I-beams, angles and channels. Wide-flange beams, so useful in the design of welded structures in the United States, are not made in Mexico. The job was further complicated by the fact that the heaviest steel available is 1-in. plate. Plates of this thickness were often welded together to produce a 3-in. thickness.

General Description

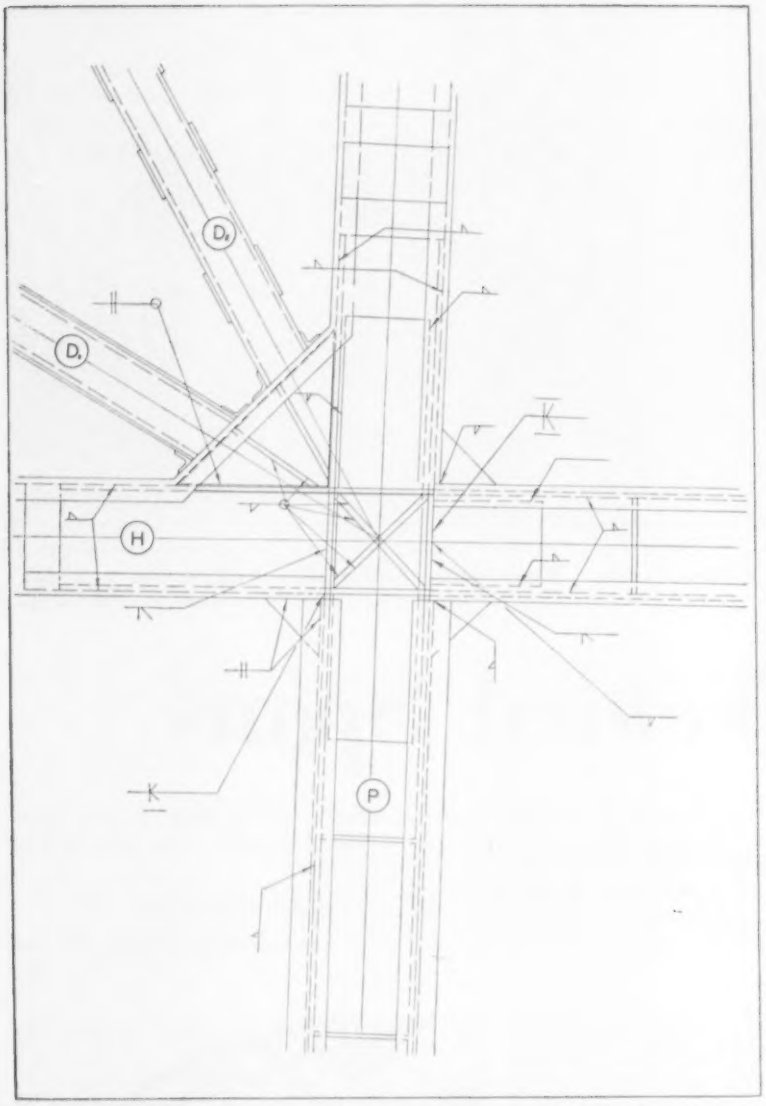
The supporting structure for the



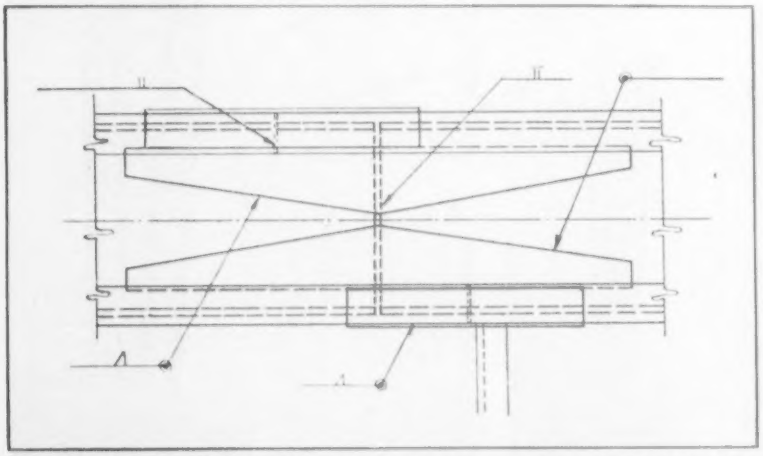
3—RAISING first radial truss with the aid of wooden towers



4—JOINING the diagonals, uprights and chords



5—KNEE joint (see also Fig. 2). Six beams—vertical, horizontal and diagonal—come together to make the most complex joint of entire truss



6—SPLICE for field welding chords to columns. Though welded with full penetration, this bayonet-type joint was also reinforced by heavy plates

ceiling and roof is formed by eight main radial frames and the two lateral walls that enclose the auditorium.

In the rear of the auditorium and behind the stage, there is a building in the shape of an inverted "U" with sides connecting with the auditorium. This provides such services as radio and television rooms. The sides of this building have in the upper part a series of statues around 30 ft high. The other part of the building has five floors and has two longitudinal passages; this is intended for storage, caretakers and for the installation of air conditioning equipment.

The balcony has a radial form and rests on the main frames on a series of columns indicated in Fig. 1 as K-100, 200, 300, 400, 500 and 600; some of the balcony frames also extend to K-700. Between the principal frames and the axis of column K-100 is the level for the restaurant, the foyer and a suspended passageway.

The metal framework of the auditorium (Fig. 2) includes four elements separated during fabrication and erection:

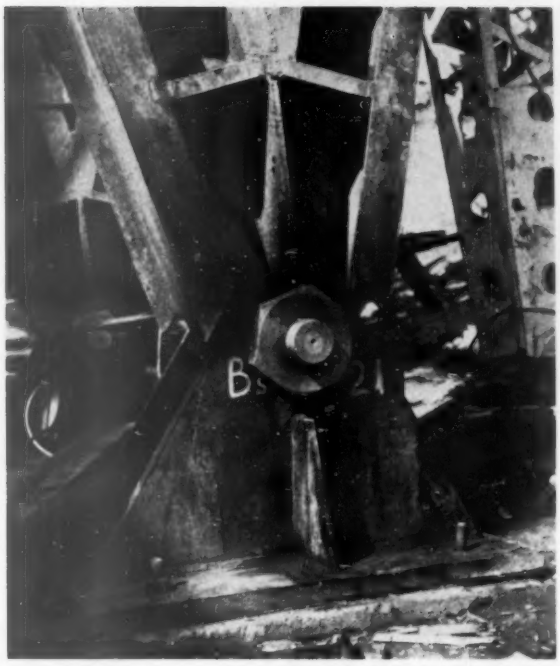
Principal roof framework.
Lateral walls.
Balcony structure.
Building structure.

Principal Framework

The roof structure consists of eight radial rigid-frame trusses (Fig. 3), symmetrically placed with respect to the longitudinal axis of the auditorium. The projected spans vary from 328 ft for the two central ones to 294 ft for the two end trusses.

The rigid frames for the roof are double and have two joints. These members were formed by two columns of variable triangular sections, and the head of the projected span is equal to 328 feet at its greatest point. The triangulation is Pratt type, with 19.7-ft panels. At the knee, it has compression diagonals similar to the stiffeners in a solid panel; in the rest of the triangulation, all the diagonals are in tension and the uprights in compression. Both uprights and diagonals are welded.

The upper and lower chords were made up of built-up beams. The web is always a 15-in. I-beam (42.9 lb per ft) and the flanges are either I-beams or channel sections of different height, to vary the cross-sectional area according to the stress taken by each panel. The uprights are double and are made of two



7—PINS connect truss to its base, allowing it to sway because of wind, earthquakes, etc. Beams that form the vee of this joint were built up from 15-in. I-beams. Note transverse stiffeners and gusset welded to the web

channel sections forming a box beam. The diagonals are also double with separating plates so that there is sufficient space for the chord.

The joints of the chord sections were alternated so as not to have more than one per panel. The frame was made of members varying from 13.1 to 78.7 ft in length and between 6 and 15 tons in weight; these members were selected so they could be handled by cranes and would result in the least number of joints on the job. The longitudinal halves of the frames are joined at 8.5 ft separation by a Warren-type triangulation in both the lower and upper chords, the length of the panel being 9.9 ft. Compression uprights were placed each 19.7 ft at the principal joints of the frame. These are formed of two angles in box section and transmit the compression due to the normal shock to the axis of the auditorium through the trusses that connect the frames and also support the roof beams.

The forementioned uprights are double, and each is made up of two channels in box section, butt welded in their extremities. The joints were made with penetration welding since these elements are in compression. The diagonals consist of two channels welded at the web and on the outside of the built-up beam that forms the chord. In cases where the diagonal tensions are very great, the box section of the chords was finished with plates.

All the beams that form the chords were stiffened by means of 1-in. plates underneath each joint and in the intermediate spaces at every 6½ ft.

The Frame Joints

Each of the large frames has three typical joints:

A. The joints between diagonals, uprights and chords (Fig. 4). The diagonals that pass alongside of the chords cut their flanges, and the area was completed by an additional plate. This was done in all the columns supporting the frames so that the flanges of the channel beams would not interfere with the covering of the columns; on the other hand the flange is not removed at the head. The uprights were butt welded with complete penetration.

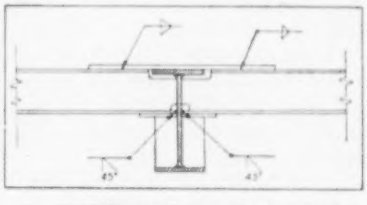
B. The knee joint (Fig. 5). This is the most complex joint of the truss since six beams join at this area. Because of the high stresses, these beams are quite heavy. This joint was designed as follows: the vertical leg (P) is a built-up H-column made of three 15-in. beams and from its center is passed the central piece (web) across the joint, cutting the flanges in it. The surface is completed with welded plates against the flanges and the web of the central beam to give it a double box section. The flanges of the leg (P) in its upper part (over the joint) were cut and one of these was bent 45 deg and continued as the web of the horizontal chord member (H). This bent part serves as a base, previously stiffened for the compression diagonals of the knee (D_1) and (D_2). Plates were also added to reinforce the flanges that were cut. Stiffeners were placed in the center of the joint to counteract heavy local bending and stresses.

C. Field welding splice for chord and column joint (Fig. 6). The joints between the members are bayonet-type and were made in such a way that the erection was easy, as each piece was placed against the other. The joint was welded with full penetration, which is theoretically sufficient for a complete joint; nevertheless, because of the difficulty of obtaining perfect joints, the joints were reinforced with plates of the same capacity as the beam that forms the web and one of the flanges. The chord, (H) in Fig 5, is made up of three spans of 78.7 ft each. These were welded directly below the spot where they would be located. They were raised (Fig. 3) until they were hooked onto the knees corresponding to the contraflexure points and were then welded in that position.

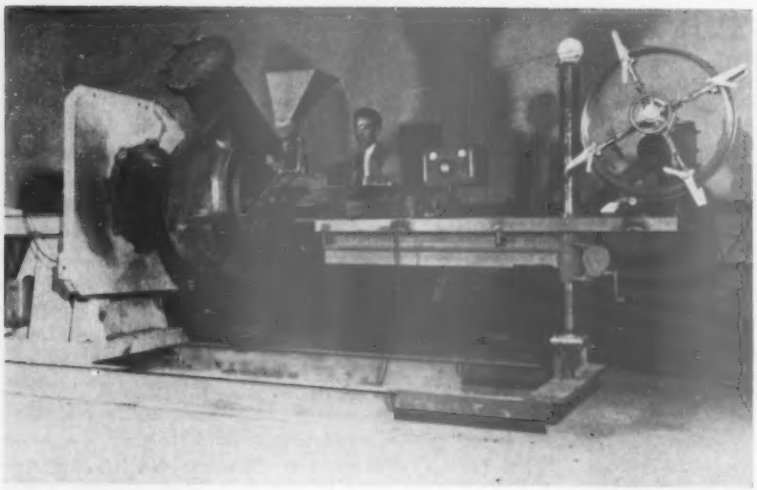
The base joints are pin-connected (Fig. 7), using in all cases A-7 type steel. In the pins the maximum penetration stress was taken as 19,900 psi, even though with static loads an increase in loading is permissible because of the impossibility of secondary stresses.

As can be seen in Fig. 7, the vee of the joint is formed by two compound beams, built-up H-columns each made up of three standard 15-in. I-beams. These two parts are joined in an acute angle so that it is necessary to cut the central flanges of these

(Continued on page 33)



8—JOINT used to obtain continuity in the secondary radial beams



JOB 1—Four 29-ton steel shells for boiler circulating pumps were to be reduced 5 inches in inside diameter. A job for submerged-arc welding

JOB 2—Tiny bimetallic component was welded by inert-arc torch

Seven Tough Jobs—and

Job 1. Rebuilding cast-steel shells to new dimensions
2. Bimetallic component of thermostat
3. Aircraft landing gear assembly
4. Light-gage aluminum ducts
5. Tanks to stand pressure of 800 psi
6. Fabricating truncated cones of sheet aluminum
7. Rings from aluminum extrusions

BY FRED M. BURT

SMALL but mighty in welding accomplishment, the Airline Welding & Engineering Co., of Hawthorne, Calif., specializes in tough jobs of precision welding for aircraft plants and other California industries. The company began operations on February 25, 1952, in a new building on a 200 by 300 ft site. Though it started out as a partnership, Airline is now owned and managed by Byron R. Russell, who employs seven skilled and certified weldors and a utility man for general work.

Welding is done by metal-arc, oxyacetylene, oxyhydrogen, submerged-arc, inert-arc and inert-arc metal-arc processes, on both ferrous or nonferrous metals.

Pump Castings Altered

Let us look at a job. Four cast-steel shells for 16-in. circulating pumps to go into a large power plant were fabricated by a western pump manufacturer for an eastern customer. After the four identical castings had been made, a design change was specified. This necessitated a reduction in inside diameter of 5 in.

At the same time, external changes were also needed. The pads or bosses, pieces 2 in. wide by 11/16 in. thick, had to be increased in size so that they would engage properly with the new cover plates for the shells.

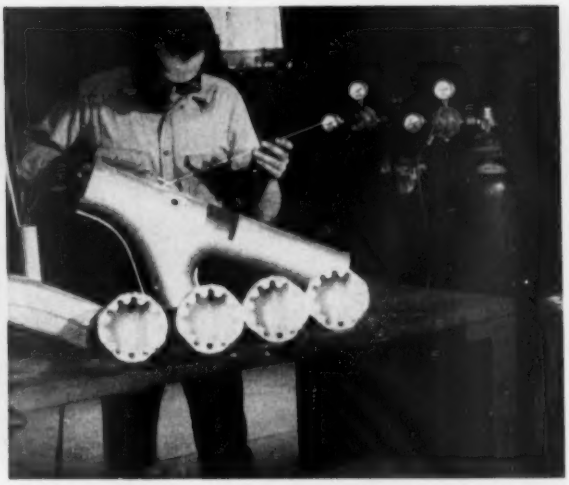
Build-up by means of deposited weld metal saved the large expense of new patterns and castings.

The castings, each weighing 5,800 lb, were handled by means of a heavy rotating positioner. The top of each casting was bolted rigidly to the positioner faceplate. Because of the irregular shape and uneven thickness of the castings, it was necessary to provide and maintain a preheat temperature of just above 500 F. This was done by rotating the casting within a ring of four natural gas burners. Marks with 500 F and 600 F temperature-indicating crayons were made at selected points on the surface of the casting. When the 500 F marks melted while the 600 F marks remained unaffected, a temperature of between 500 and 600 F was indicated, a close enough control for preheating.

Made 300 Passes

The internal build-up to decrease bore dimension was done by submerged-arc welding and required about 300 passes. A low-carbon steel wire was used, and the submerged-arc head was supported on a variable-speed carriage to facilitate movement of the head inwards and outwards. Each rotation of the casting engaged a microswitch, which energized a motor. The motor moved the carriage a short distance—just sufficient to cause the next bead to overlap the previous one. After one layer of beads had been deposited with an inwards movement, the carriage was reversed so that the next layer would be deposited with an outwards movement. The layer after that was laid with an inwards movement again and so on.

JOB 3—Chrome-moly steel components assembled for aircraft landing gear. Another job for submerged-arc



JOB 4—Light-gage aluminum ducts for aircraft call for the oxyhydrogen torch to weld longitudinal seams

How They Were Licked

Another circumferential layer of weld metal $\frac{5}{8}$ in. thick was laid manually in such fashion as to blend into the largest casting diameter. This eliminated a considerable amount of postweld grinding.

The external build-up on the pads or bosses was also done manually

SEVEN-STEP PROCEDURE

1. As a preliminary to the rebuilding of the 16-in. circulating pump shells, standard .505 tensile test bars were prepared of all weld metal. A .505 bar is a cylinder machined to a diameter of 0.505 in. This value is chosen as a standard because when you square it and multiply it by $\frac{1}{4}\ \pi$ ($\frac{1}{4}\ \pi\ d^2$ = area of circle) you will get a cross-sectional area of very nearly 0.2 sq in. (more exactly, 0.2002966 sq in.). Hence any test loads can be very easily converted to pounds per square inch by simply multiplying the test loading (for 0.2 sq in.) by five.

From these tensile test bars, the yield strength, ultimate strength and ductility of the weld metal (reduction of area and elongation) were determined.

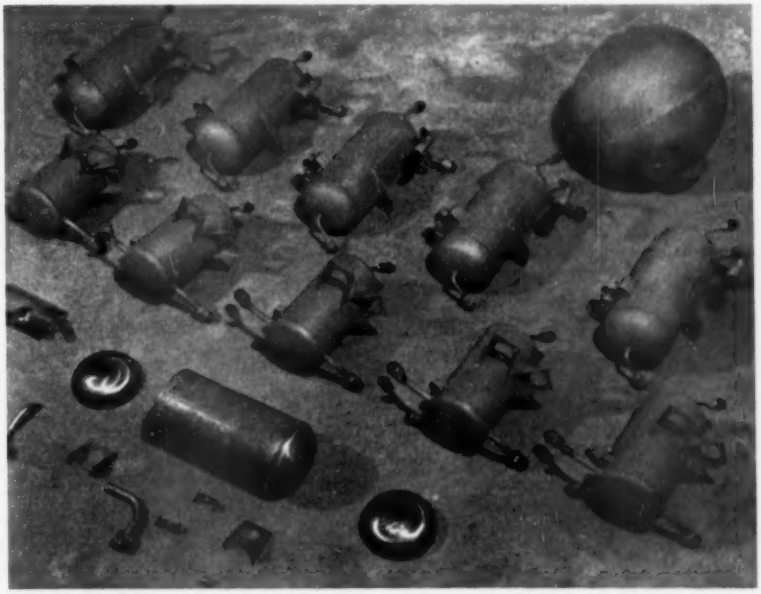
2. As another preliminary, a standard ASME transverse bend test was made of weld metal deposited with a specified welding wire and flux. Both the tensile specimen and the transverse bend specimen were stress relieved at 1,150 F for one hour after welding; stress relieving was required of the final welded assembly.

3. A ring was machined away from the upper part of the shell. Several passes $\frac{1}{8}$-in. thick were deposited with the test-approved wire and flux and inspected visually for cracks.

4. Lugs of the shells were machined away, and adjacent cast surfaces were cleaned up for welding. External surfaces were ground until all traces of cast skin had been removed.

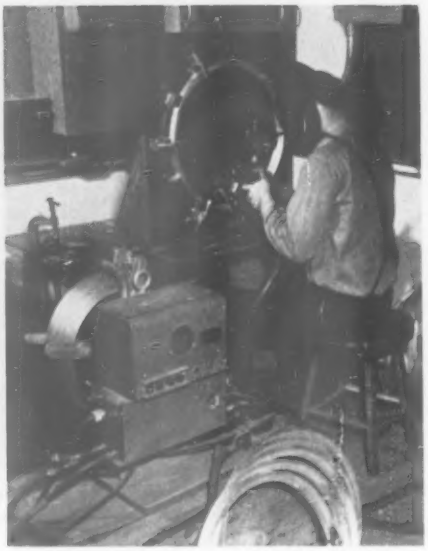
5. Castings were positioned for automatic welding and preheated to a minimum of 500 F as previously explained.

6. The entire inside surface was submerged-arc welded to half the thickness of the specified deposit.



JOB 5—Formed from stainless-steel components, the tanks shown above must withstand a pressure of 800 psi. Job was done by inert-arc welding

JOB 6—Large truncated cones of 61ST aluminum get their longitudinal seams welded by inert-arc machine on a specially made fixture



JOB 7—Aluminum sections are welded into rings by inert-arc metal-arc method

Then the outside was manually welded with E-6010 electrodes to half the required thickness. A magnetic-particle inspection was made and defects repaired, after which the shell was stress relieved at 1,100 F for five hours after reaching temperature. The shells had to be sent over to a nearby heat-treating company for stress relieving.

7. The shell was preheated as before, and the welding completed, both manual and automatic. Magnetic-particle inspection and repair of defects was followed by another five-hour period of stress relieving at 1,150 F. The entire welded zone was then inspected by gamma rays and reinspected after finish machining by the magnetic-particle method.

Just by way of contrast with Job 1, Job 2 is one of thousands of small parts that are production hand welded to exacting requirements with the inert-arc tungsten-electrode torch. This tiny part is the bimetallic unit of a thermostat. It represents an extreme in smallness of the parts welded, while the big pump shells are at the opposite end of the size scale.

It is in the design of ingeniously devised fixtures, accessories and controls that Airline excels.

Aircraft Landing Gear

Job 3 was the landing gear assembly shown in picture 3. This is composed of three components of SAE 4140 chrome-moly steel. The parts, on the layout table, were washed in carbon tetrachloride and then assembled and tack welded with extreme care to achieve a final tolerance within 1/64 in.

The tack-welded assembly was attached to a rotating fixture having adjustable clamps on each side and was preheated to 600 F (again using temperature-indicating crayons) with an oxyacetylene ribbon-flame burner. The circumferential weld that joins the two large parts was made by submerged-arc with an alloy-steel wire. The smaller end part was attached by welded buttons (after another preheating) by manual metal-arc welding. Superfluous metal on the buttons was ground off flush, after which the assembly was stress relieved for 47 minutes at 1,150 F approximate temperature, using the ribbon burners and temperature-indicating crayons. The welded assembly required about two weeks of machining by the customer aircraft company to bring it to the extremely close finished dimensions specified.

Gas-Welded Aluminum

In Job 4 we see oxyhydrogen welding on light-gage (0.020 in.) aluminum ducts for aircraft. The material is 52SO heat-treatable aluminum. Success in this critical job is highly dependent on the weldor's skill in the adjustment and manipulation of his torch.

Just before assembly, the formed parts are degreased in a hot alkaline solution at 180 F and are then plunged into an acid etching bath for removal of surface oxide. The parts are then assembled and tack welded in precision jigs. The weld metal is deposited on the outside only, using a 5% silicon filler rod. Penetration is such that the bead on the inside is about the same as on the outside except that it is slightly more even. Dimensions must be kept to close tolerance for a mating fit with a larger unit. A sizing block is inserted after each end to check the fit to about 1/64 in.

More Special Fixtures

The tanks shown in Job 5 are required to stand 800-psi working pressure. One of these tanks is formed from 347 stainless steel 0.125 in. thick and has 15 component parts. The heads are blanked out of flat stock and dished; the body is rolled and inert-arc welded into a cylinder. The heads are inert-arc welded into the cylinder. Then the tubing, formed to precision dimensions with the tube ends flared to receive nuts, is placed in precise position in relation to the cylinder in a fixture and inert-arc welded into place. The positioning and welding tolerance is less than ½ degree of the circular cross-section. The stamped brackets are attached to complete the inert-arc welding, and the cylinders are given a 1,200-psi pressure test using a hydrostatic test.

Mr. Russell himself designed the fixture shown in Job 6, which is adaptable to both inert-arc and submerged-arc welding and to flat or any type of curved surfaces. The large aluminum truncated cones are portions of droppable gasoline tanks. Though only one longitudinal inert-arc weld is made, the job is not simple due to the necessity of maintaining a flat, smooth surface at the weld on 61ST aluminum alloy 0.092 in. thick. To prevent cracking, a filler rod containing 5% silicon is used for about the first ½ in. of weld; the rest of the seam is fused without filler metal. The fixture holds the two edges of the cone in perfect alignment and solidly against each other on the copper backing bar.

Fast production runs are required on the aluminum tank sections, the current order for which calls for 50 per week for 4 weeks, 100 per week for 4 weeks and then 175 per week for several months. The foreground of the same picture (Job 6) shows sections of afterburners made for four different jet-engine manufacturers. The material is a super-heat-resistant alloy 0.020 in. thick. To save loss on the expensive and scarce material, the customers supplied scrap pieces to use in trying out the welding machine for heat and speed. In this way the proper settings were learned without loss of stock.

Equipment for welding extruded aluminum units by inert-arc metal-arc welding (Job 7) again illustrates the inventive genius found at Airline. The fixture is designed to align and hold in place the abutting ends of extruded aluminum stock while making an inert-arc metal-arc weld. Individual clamps hold the rings in exact alignment. A foot pedal actuates an air cylinder (mounted on the back of the plate), which pulls the ring over from the right to close the gap. Air pressure then holds the ends to be welded in tight aligned abutment, while the weld is made over a water-cooled copper back-up shoe. The arc is maintained in a shield of argon gas between the filler metal and the workpiece, while the electrode is fed continuously from a coil.

Welds made by this process are clean and smooth, requiring little finishing. Previously, it took an average of about 12 minutes to complete each weld by the manual inert-arc method. Now a weld is completed in about nine seconds after positioning.

MEXICO CITY AUDITORIUM

(Continued from page 29)

beams, finishing them on transverse stiffening plates, from which rise the webs. Webs have been reinforced by two 2-in. plates, which provide a minimum support of 4.6 in. To stiffen this zone further, two gusset plates were placed on each side of the web.

The concentration of stresses in this zone was studied by means of a photoelastic model. The vertical plates were designed by calculating the critical bending loads and applying a factor of safety of two, and gussets were added to stiffen the part against bending. The welding of the bases presented several difficulties because of the contraction and distortion produced by the excessive heat. The 2¾-in. base plates bent easily when they were welded to the vertical plates that were going to receive the direct load of the pin. The vertical plates were connected to the base plate with a 1-in. continuous fillet weld made in eight or ten passes. The excessive heat produced great distortion, which was only avoided by welding two bases simultaneously and fixing the base plates back-to-back.

The base was fixed to the foundation by means of six bolts in the concrete and a piece of tube on the upper part. Purpose of the tube was to allow movement in the anchors and to ease the mounting of the frames; the space between the anchor and the tube was later filled up.

Computation of Loads

The load on the frames was taken as 51.2 lb per sq ft plus its own weight, previously calculated to be about 1 ton per 3.28 lineal ft. The balcony loads vary between 154 and 164 lb per sq ft, including the weight of the structure and dead and live loads. The horizontal loads considered were the wind load and earthquake load. The wind is taken as blowing against the sidewall and the facade at an intensity of 14.3 lb per sq ft; the earthquake load is considered as an acceleration of 1/20th the acceleration of gravity, acting normal to the axis of the auditorium.

For the effects of normal earthquake on the axis of the auditorium, the great frames were considered as joined to the knees by means of a gate structure consisting of two very heavy trusses, one vertical and the other horizontal, besides two struts, one in each angle of the knee. Between these, a Warren triangle was set up.

The approximate weight of each frame is 200 tons, including the panels, bases, pins, etc. The fabrication of parts weighing this much naturally requires that they be subassembled in units that can be moved. Since there were available cranes of 10 to 20 tons capacity, the maximum weight was fixed between 6 and 15 tons. For this reason, the main frame was divided into ten parts.

Balcony Erection

The principal balcony structure consists of: (1) a series of eight radial frames connected to the principal frames of the auditorium and (2) two end radial frames connected to the end lateral columns. Also in radial form, in part of the lower balcony and the one corresponding to the foyer level, are two intermediate frames between the two previous main frames. These frames are connected circumferentially by means of a series of connections at all levels.

The loads used in the design of this structure were the following:

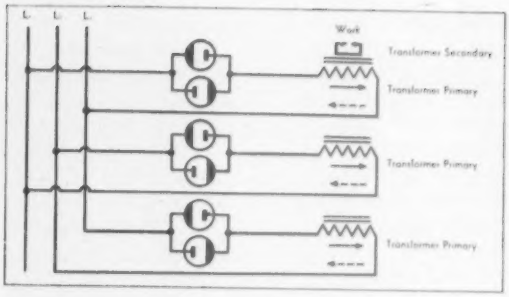
Balconies	154 lb per sq ft
Corridors and stairs	164 lb per sq ft
Foyer and restaurant	133 lb per sq ft
Wash rooms	123 lb per sq ft

The structural elements of the restaurant were computed as being freely supported. The secondary elements of foyer level likewise were considered as being freely supported.

With the object of obtaining continuity between the secondary radial beams, both in the restaurant level and in the foyer, the welded joint shown in Fig. 8 was used.

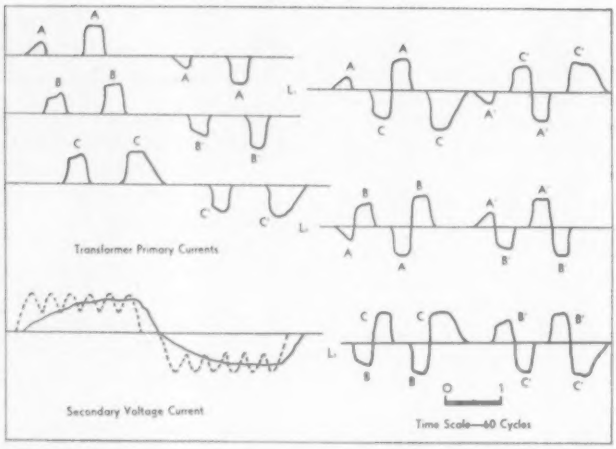
The foyer level extends out in cantilever to receive the window structure of the facade, which is built of 15-in. I-beams. In general, it can be said that the fundamental problems in the balcony were due to the great spans and heavy loads, together with the fact that the heights were always very low.

General contractor for the Mexico City municipal auditorium was Cia. Constructora Internacional, S. A. The architect was Fernando Beltran Puga, and the builder and erector the Macomber de Mexico, S.A.

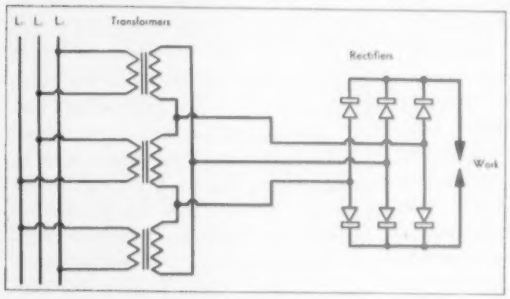


Frequency Converter

1—ELEMENTARY circuit (above) of a frequency-converter system for three-phase welding. System is essentially a half-wave rectifier (see text)

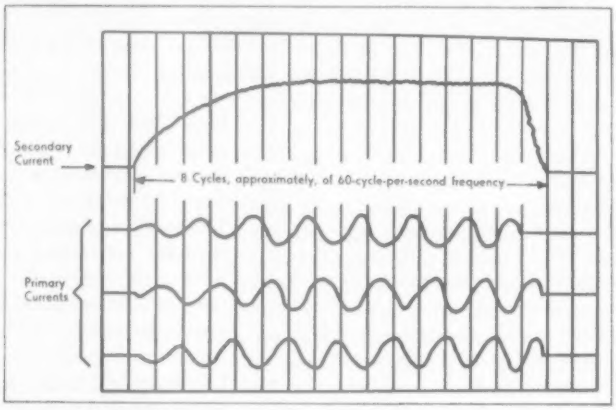


2–WAVE shapes of currents with frequency-converter system



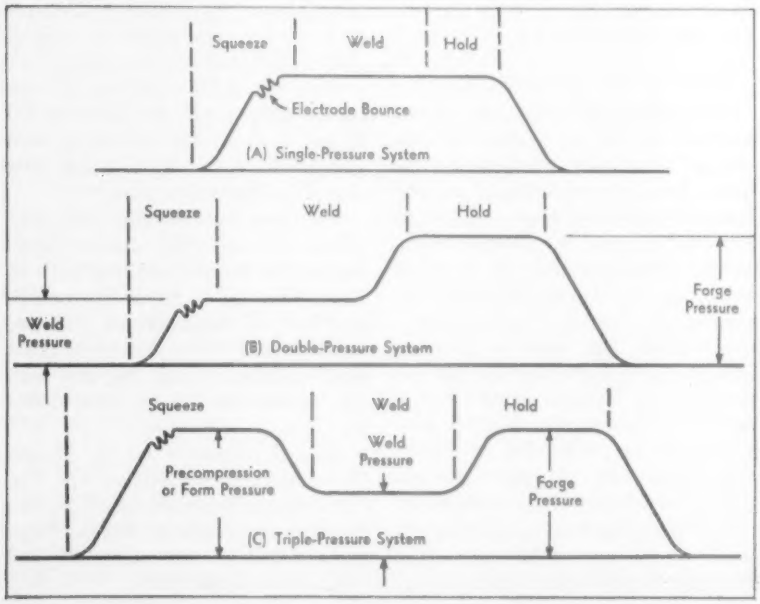
Dry Disc Rectifier

3–CIRCUIT for dry disc rectifier (above). This system delivers a low-voltage direct current. The primary currents are balanced and sinusoidal



4—PRIMARY and secondary current of a dry disc rectifier

Current, Force and Time



5—SCHEMATIC at left shows three chief pressure systems, A, B and C. Welding force is the product of the pressure in psi times the piston area

How they are measured on resistance welders

BY DEAN L. KNIGHT
Chief Welding Engineer, National Electric Welding Machines Co.

KIPLING wrote of six serving men whose names were *Where* and *Why* and *When* and *How* and *What* and *Who*. Resistance welders have only three such serving men. Their names are *Current*, *Force* and *Time*. Welding schedules and procedures should be calibrated in these three basic terms. The performance of each machine should be studied and re-

corded in terms of *current, force* and *time*. Not until this has been done can a full understanding be gained of the machine's performance and characteristics.

Better instrumentation, better methods of taking and recording measurements, have made it possible to secure the accurate, detailed information on welding schedules and practices for which industry is clamoring today. It is my purpose to discuss briefly how the variables of current, force and time may be measured. First, though, it might be well to discuss the type and characteristics of the resistance-welding equipment that is most commonly used.

Electrically, the equipment can be divided into two general classifications: direct energy, which takes power only during the time a weld is being made, and energy storage, which stores energy (either continuously or during the interval between welds) and releases the energy when the weld is made.

Single and Three-Phase

Direct-energy equipment can be broken down into two general types: (1) single-phase line-frequency equipment and (2) three-phase equipment. Three-phase equipment breaks down in turn into: (*a*) frequency converters and (*b*) dry disc rectifiers.

The single-phase a-c welder is the simplest and most widely used type. Table I shows the approximate electrical characteristics of standard spot, projection and seam welders. Of interest is the ratio of maximum demand to nameplate kva rating (last column). This ratio varies a good deal but is almost always greater than one. Welding techniques require short weld times and relatively high-energy inputs. As a result, the nameplate rating of the welder bears little relationship to the maximum power demand. To measure the short "on" times and high current values requires entirely different techniques from those employed for motors and other electrical devices having steady loads.

Going on to three-phase direct-energy welders, we find two principal types. The frequency converter welder uses six ignitron tubes and associated control circuits to deliver welding current at lower frequencies than that of the power supply system. Figure 1 shows the elementary circuit—essentially a half-wave rectifier with the direction of rectification reversed at preset intervals. The welding transformer is not in a true sense a three-phase transformer but is a single-phase transformer having three separate and independent sets of primary coils. Each primary is connected to one phase through ignitron tubes that are connected in inverse parallel. Each phase carries current approximately one-third of the time.

The voltage applied to the frequency converter is sinusoidal, but the currents are non-sinusoidal. Figure 2 shows some of the weird-looking wave shapes of primary and secondary currents.

The dry disc rectifier welder, the second type of three-phase welder, incorporates a dry disc rectifier unit that delivers low-voltage direct current to the weld. The secondary welding current is d-c, and the primary currents are balanced and sinusoidal. A schematic diagram of the dry disc power circuit appears in Fig. 3, while Fig. 4 shows the approximate shape of the primary and secondary currents.

At the present time, there is very little activity in new stored-energy welding equipment. Older equipment is still in use, however, and stored energy may return to some popularity in the future. There are two systems: electromagnetic, storing energy in a magnetic field, and electrostatic, storing energy in condensers.

Types of Force Systems

Along with the electrical measurements, it is necessary to measure and study the force characteristics of the welding machine. In general, there are three types of force systems:

A. Single-pressure systems (weld pressure only)

B. Double-pressure systems (weld and forge pressure)

C. Triple-pressure systems (precompression, weld and forge)

These three pressure systems are shown schematically in Fig. 5.

The foregoing outline is admittedly brief and by no means covers all types of machines built during the past twenty years. However, it is representative of the machines in general use today.

Single-Phase Measurement

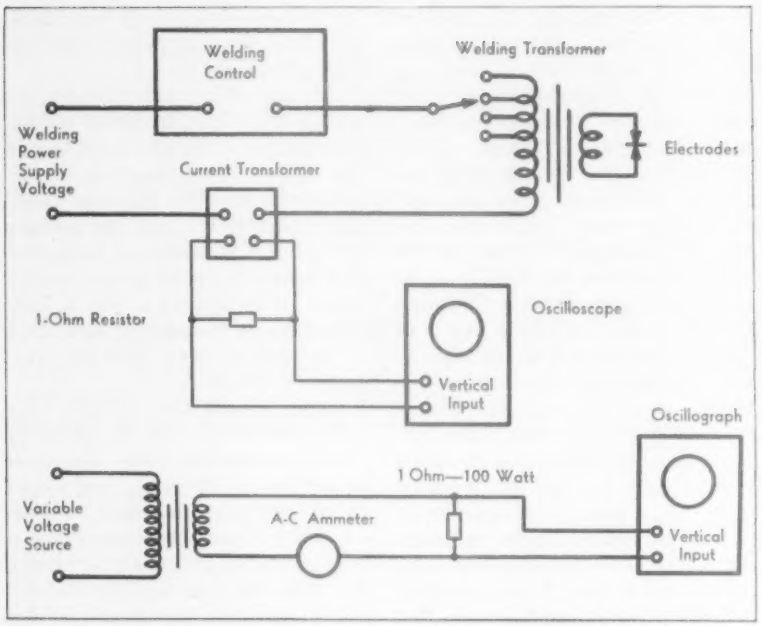
In single-phase a-c machines, the measurement of secondary current is rather simple and quick. An indirect method is employed. Neglecting small transformer losses, the secondary current is equal to the primary current multiplied by the turn ratio of the transformer. If the turn ratio is not known, it can be determined by measuring the primary and secondary voltages simultaneously with the welder secondary circuit open or insulated. The turn ratio is the primary voltage divided by the secondary voltage.

Primary currents must actually be measured. Since welding currents are

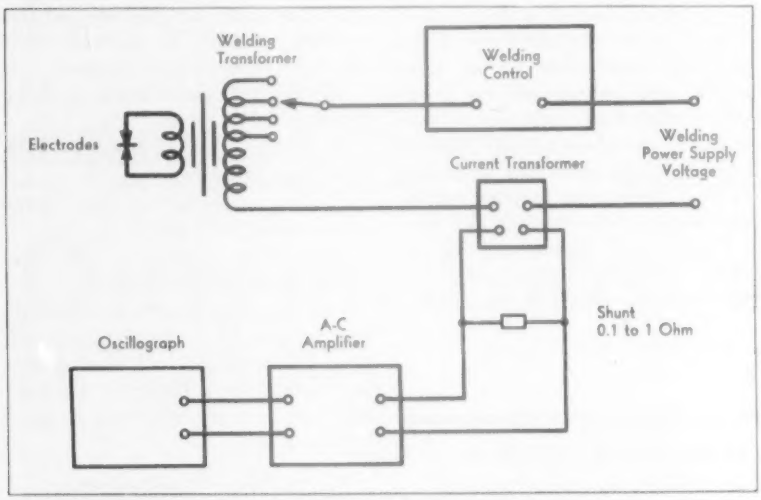
Single-Phase Welders

Table I. Electrical Characteristics of Standard RWMA Welders

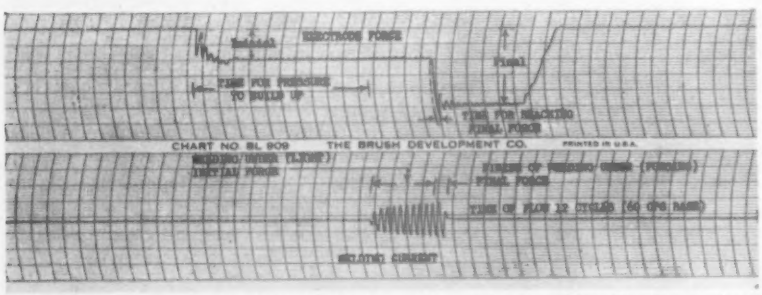
	Welder Frame Size	Kva	Throat Depth	Throat Opening	Sec. Amp Short Circuit ± 10%	Power Factor Short Circuit	Max. Kva Demand Short Circuit	Ratio Max. Demand to Nameplate Rating
Spot	1	75	24	8	23,500	0.28	185	2.47
	2	100	24	8	29,500	0.30	240	2.40
	2	150	18	8	41,800	0.32	418	2.80
	3	250	36	8	48,000	0.30	675	2.70
Projection	1	75	18	8	31,200	0.32	245	3.27
	2	100	18	8	39,500	0.30	322	3.22
	3	150	30	8	42,800	0.28	495	3.30
	3	250	12	8	80,000	0.34	960	3.84
	4	500	30	8	90,000	0.28	1,950	3.90
Seam	1	75	24		22,000	0.36	124	1.65
	2	100	18		29,500	0.37	175	1.75
	2	150	30		28,000	0.32	206	1.37
	2	200	42		30,000	0.29	300	1.50
	3	400	36		45,000	0.29	600	1.50



6—CATHODE-ray oscilloscope provides one way of measuring the primary current. The image on the oscilloscope is adjusted to a suitable amplitude with the current at 100% (full sine wave), to begin a reading



7—DIRECT-inking oscillograph is another instrument to measure primary current. This device uses a moving coil galvanometer suspended in a magnetic field. The inking pen is attached to upper end of moving coil



8–CHART produced by direct-inking oscillograph (see Fig. 7) shows the welding force and the duration and magnitude of the primary current

usually two to six times the full-load rating of the transformer and welding times are exceptionally short, it is generally impractical to leave the current on long enough for the ordinary meter to indicate accurately. However, a pointer stop meter can be used satisfactorily. This is a standard meter with a stop to prevent the pointer from returning to zero. In measuring the short-duration primary current, the pointer is gradually moved up the scale by adjusting the stop until the pointer just leaves the stop when the weld is made. The meter should be of the iron-vane repulsion or dynamometer type with a range 0/2.5/5.0 amperes. The current transformer to be used with the above meter should be of approximately 25 volt-ampere capacity and have a range suitable for the currents to be measured. If available, a tong-type ammeter is more convenient to use than the current transformer and ammeter, but its readings are, in general, not as accurate. Tong-type ammeters with a rectifier movement are especially subject to wave-form errors when used on non-sinusoidal waves; they should be used only when the control is set for 100% current.

Can currents be measured accurately on phase-shifted waves? The question is one that comes up perennially. Rectifier-type instruments measure the average values of current not RMS (root-mean-square). The instrument is calibrated in terms of RMS under the asumption that the wave is sinusoidal. If the wave form is not sinusoidal, the meter will not read correctly.

Moving iron and dynamometer type instruments are much less susceptible to wave-form errors, and such errors as occur are caused mostly by high frequency. These instruments can be used to measure phase-shifted currents accurately provided the phase shifting is not severe. If the wave form departs very appreciably from sinusoidal, an error may be introduced. To eliminate the possibility of meter errors, it is best to take secondary current measurements at 100% phase shift or as near 100% as possible.

Primary current may also be measured with a cathode-ray oscilloscope (Fig. 6). A current transformer is connected in the primary. The secondary of the current transformer is

loaded with a 1-ohm resistance, and the vertical input of the oscilloscope is connected across this shunt. The image on the oscilloscope is adjusted to a suitable amplitude with the current at 100% (full sine wave). Leaving the oscilloscope at exactly this setting, the resistor is removed from the secondary of the current transformer and is placed in series with an ammeter and a variable current source. If the current is then adjusted so the image in the screen of the oscilloscope is exactly the same size as the image previously formed by the primary, the primary current will be the ammeter reading times the current transformer ratio.

Direct-Inking Oscillograph

Primary currents can also be measured by use of a Brush direct-inking oscillograph, which is designed to make direct-inked records of electrical potentials from d-c to 120 cycles per second. The instrument uses a D'Arsonval moving coil galvanometer element that is suspended in the field of a powerful magnet. The inking pen is attached to the upper end of the moving coil system.

A current transformer, an a-c amplifier and a shunt variable resistance from 0.1 to 1 ohm are required along with the oscillograph. The equipment is connected as shown in Fig. 7. The combination a-c amplifier and oscillograph is calibrated to give a known voltage per division deflection. The total voltage recorded on the oscillogram is divided by the resistance of the shunt. This gives the amperage of the transformer secondary. The secondary current is in turn multiplied by the turn ratio of the current transformer to get the peak primary current. Assuming a sinusoidal wave shape, the RMS primary current will be the peak value multiplied by 0.707.

The direct measurement of secondary current is difficult because of the very large currents at low voltages. However, with single-phase equipment, I know of no instance when it is necessary to measure secondary current directly.

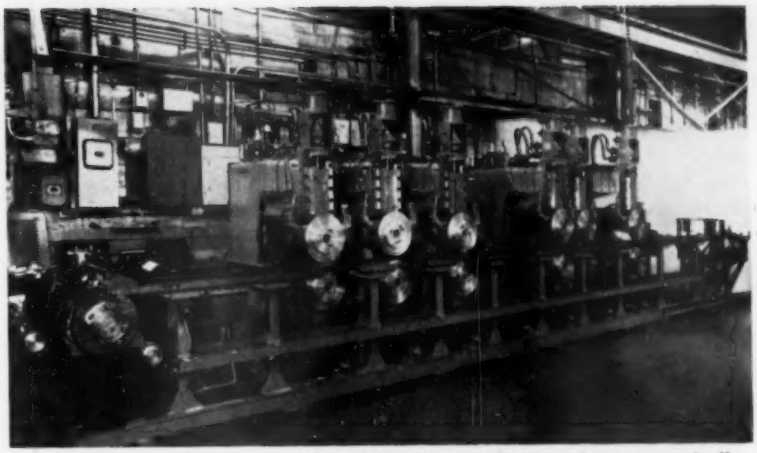
Three-Phase Measurement

Frequency converters produce non-sinusoidal primary currents and the current in any one phase is "on" only approximately one-third of the time. Therefore, it is simply not possible to measure the primary RMS current in any one phase and determine the secondary current by use of the transformer turn ratio. In fact, because of the wave shape, secondary RMS currents are difficult to determine under any circumstances. It is possible to determine the peak secondary current by measuring the peak primary current and multiplying by the transformer turn ratio. This can be accomplished by using an oscilloscope or oscillograph. For direct measurement of the peak secondary current, the following two methods may be employed:

1. Calibrated secondary shunt with oscillograph.

2. Calibrated toroidal coil to be slipped over the arms of the secondary circuit or one of the electrodes and used with an oscillograph. With a toroidal coil, an integrating circuit is usually required.

In both of the above methods, the difficulty arises in accurate calibration of the shunt or toroidal coil. Shunts add resistance to the secondary loop that must be taken into account.



SEAM-welding equipment with stock-feeding mechanism for automatically feeding, locating and continuously welding sheet-and-channel assemblies for refrigerator evaporators. Six channels are welded on each evaporator sheet at a welding speed of ten to twelve feet per minute. The material is 0.032-in. aluminum. Welding heads are rated 150 kva, single-phase, 60-cycle; each head is roller-bearing-mounted and connected to air cylinder of frictionless diaphragm type. A wheel dresser that removes electrode pick-up automatically is also incorporated in the equipment

MULTIPLE-electrode, multiple-transformer spot welder is comprised of 42 transformers and 166 electrodes. Each transformer is rated 40 kva, single-phase 60-cycle. Job is to spot weld side sills to underbodies of automobile underframes; production rate is 100 frames per hour. Transformers fire in sequence (series welding) in order to reduce the load

In dry disc rectifier machines, the primary current is balanced and sinusoidal, but it is not directly proportional to the welding current. The primary current will depend in part upon the rectifier characteristics and number of rectifiers used. There is a ratio that can be used over normal ranges of welding current to obtain a close approximation to secondary current values. The welder manufacturer must be consulted to ascertain this ratio for a given welder. The usual procedure in measuring secondary current on this type of equipment is to use a calibrated secondary shunt (actually part of the secondary circuit.)

Stored-Energy Systems

With stored-energy welders, different conditions exist in the electromagnetic and electrostatic equipment. In the electromagnetic system, the primary current is not proportional to the secondary welding current in either magnitude or wave shape because the strong pulse of secondary current occurs when the primary circuit is interrupted. Therefore, the magnitude and wave shape must be measured on the secondary side only.

In electrostatic stored-energy equipment, the wave shape and primary current of the welding transformer are directly proportional to the secondary welding current output. Primary current, however, is defined as the current supplied to the primary of the welding transformer, not the current drawn from the three-phase line by the rectifier. The rectifier current, naturally, has no particular relation in wave shape or magnitude to the welding current. Because wave shape and magnitude of the secondary current of the welding transformer are directly proportional to the primary current, the current can be measured on either the primary or secondary side of the welding transformer. With stored-energy equipment, no direct attempt is made to control time and current as pure values. Instead, the wave shape and peak current are varied. Secondary current as a rule is calibrated in terms of maximum peak value.

Measuring Welding Force

It is common practice today to record welding force in terms of the total force exerted by the air or oil on the operating cylinder. This will be the product of the piston area times the pressure in pounds per square inch. This is static force and disregards all friction of moving parts, including cylinder packings. It also disregards the weight and inertia of the moving parts. The above two factors tend to offset each other so that the results are accurate enough for most practical purposes.

A more accurate measurement of static force can be obtained with a direct force-measuring device, for instance, a U-pole gage (commercially available). The indicator of this instrument measures the deflection of the U directly in terms of pounds of force.

It is often necessary to measure force dynamically during the actual weld. A number of factors may bring about a change in force. Inertia will retard the follow-up of the electrode system during the weld, resulting in a momentary reduction in electrode force. Frictional forces may change during the weld, increasing or decreasing the pressure. On dual-pressure systems, the point of forge application and speed of high pressure build-up are important functions in weld quality that require calibration. These can only be properly evaluated by dynamic measurement of force.

The use of strain gages permits accurate determination of welding force both statically and dynamically. These gages are connected into a bridge circuit, and, by means of an oscillator, filter and amplifier, the output of the bridge is recorded by an oscillograph. In the case of spot welders, four strain gages are usually mounted on a reduced section of one electrode. For seam or projection welders, the strain gages may be connected to a reduced section on the piston rod of the hydraulic or air cylinder, or a load cell is mounted under the lower electrode or secondary arm extension. By such means, accurate welding forces can be recorded and calibrated during the actual welding operation.

Time Easy to Measure

Weld time or duration of welding current flow is easily measured in several ways. If the Brush direct-inking oscillograph is used to measure the welding current, it will also give welding time calibration.

Figure 8 reproduces a sample Brush chart that shows welding force and primary current, indicating time and magnitude. Welding times may also be calibrated by cathode-ray oscilloscope and oscillograph. Also available commercially are cycle recorders of the electromagnetic type that record on a tape capable of being immediately inspected.

Special Instruments

Two special instruments are commercially available to measure current, force and time on resistance-welding equipment. One is the General Electric current-force recorder, which includes an oscillograph and special electrode holder. It records simultaneously a timing wave and the rapidly changing electrode force and welding current. The measurements of secondary welding current are obtained directly by the calibrated shunt in the special electrode holder, which also contains the wire strain gages. The variables measured are recorded on a photographic film, which must be developed and thus makes immediate inspection impossible.

The other instrument for resistance-welding equipment, introduced by the Brush Development Co., is known as the "Welding Analyzer." It includes a d-c amplifier, a universal amplifier and a direct-writing magnetic oscillograph. The amplifier and pen motor have been changed from their previous models to enable the instrument to record at 180-cycle frequency when used with the magnetic oscillograph. Used in combination with a toroidal coil, or calibrated secondary shunt, and strain-gage electrode, the "Welding Analyzer" will record current, force and time on a chart ready for immediate inspection. Though designed primarily for use with three-phase, direct-energy equipment, the instrument can be employed on all types of welders.

The foregoing constitutes a rather brief discussion of instrumentation for resistance welders and in no way covers the entire subject. There are many other schemes for measuring the variables. Additional information can be found in the RWMA handbook or obtained from the individual manufacturers of welding machines.

Guesswork and rule-of-thumb determinations may be considered as things of the past in resistance welding. Proper instrumentation and recording, however, underlie all the advances that have been made in welding techniques and practices.

10 Weeks Make a Weldor

Classroom theory and application are given at Army Ordnance welding school. But making all-around weldors out of enlisted men requires more than a school curriculum.

BY H. C. PHELPS

LEADING a company of barefooted South Koreans, Captain William A. Hackenbrach walked over 490 miles up the east coast of Korea, repairing battle-damaged equipment. Of necessity, his welding methods were makeshift — methods that the average weldor would consider impossible. However, they worked. During his long tramp (ten months in all) over the sometimes frozen muck and mire, Captain Hackenbrach made a promise to himself. He said that if he ever got the chance to teach men to weld, he would teach them to use ingenuity along with it.

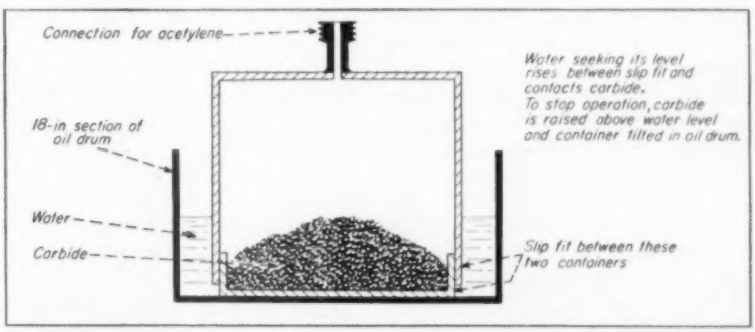
Captain Hackenbrach's chance to teach welding ingenuity finally came. He was rotated back to the United States for duty and was assigned to his present position of branch chief of the Metalworking Branch of Aberdeen Proving Ground Ordnance School. Before we get to that, however, let's have a look at conditions in Korea.

Welding was over 75% of all repair work performed during the first three months of the "police action" in Korea. Parts were not available at this early stage, so many parts were welded that are not normally repaired.

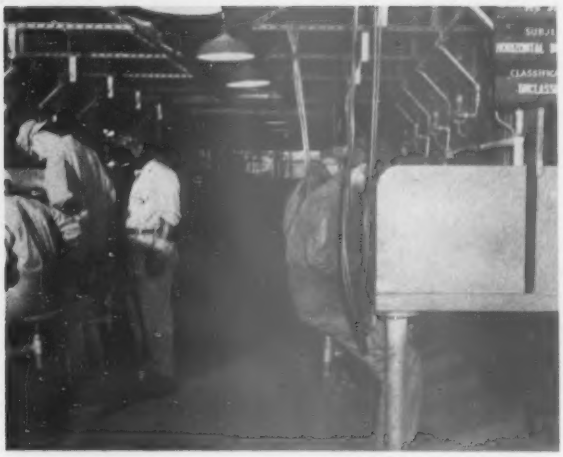
HEADACHES FROM ACETYLENE

Some of the biggest Korean headaches were caused by acetylene. Because of a severe shortage of cylinders, acetylene had to be produced from Korean carbide. This impure form of calcium carbide contains a compound called phosgene. Phosgene is a deadly poison if inhaled in even small amounts (it was one of the poison gases developed during World War I), so consequently all oxyacetylene welding had to be done out-of-doors. And Korean winters are long and cold!

Not having any acetylene generator, the captain made one out of abandoned gasoline drums. (See sketch below.) He took two drums and reduced one so it would slip into the other, forming a chamber for carbide. This unit was then stood inside


Connection for acetylene
Water seeking its level rises between slip fit and contacts carbide. To stop operation, carbide is raised above water level and container tilted in oil drum.
18-in. section of oil drum
Water
Carbide
Slip fit between these two containers

ACETYLENE generation—Korea style. Not recommended for civilian service



GAS welding class. Chief Welding Instructor Osborn says that this class is hardest of all upon uniforms

FLAME-CUTTING 3-in. armorplate—a job they will later have to do in the field under battle conditions

a much bigger oil drum that was filled about one-third full of water. The water, seeking its own level, seeps between the slip fit of the two inner drums and thus gradually comes in contact with the carbide. As gas pressure is built up, the back pressure checks the flow of water so it does not reach the carbide in excessive—and explosive—amounts. To stop acetylene generation, the carbide is simply raised above the water level and the container tilted in the oil drum.

Use of such equipment for generating acetylene is not recommended in the United States. It shows, however, to what lengths men will go to win a war.

The captain wasn't alone with all the headaches. Soldiers in Korea are often called on to pull rabbits out of the hat to keep army equipment rolling. Warrant Officer Bernard Cohen had his own peculiar problems in the supervision of three machine shops and two portable welding vans.

One of the jobs that Cohen's crews was often called upon to do was to weld gasoline tanks. As you might expect, gasoline tanks are a frequent casualty in battle. After the crew had gone out and recovered the damaged vehicle (something of a story in itself), they would place one end of a rubber hose in the leaky gasoline tank. The other end went over the exhaust pipe of a truck engine, which was run for about an hour. The carbon monoxide from the exhaust drove out the raw gasoline fumes. After the engine had been shut off and the carbon monoxide (which is explosive under some conditions) allowed to diffuse into the atmosphere, the tank could be welded without exploding and injuring the weldor. A strictly emergency procedure, not recommended for garages!

Cohen won recognition for another ingenious trick. Land mines were blowing up the escape hatch on the floor of the military tank and injuring the assistant driver inside. Cohen hit upon the idea of welding a sprocket (removed from an abandoned tank) on the underneath side of the hatch to prevent the cover from being blown inside.

The escape hatch is on the outside bottom of the tank. When released, it falls to the ground and allows the crew to crawl out. On older models, the hatch cover was concave—a bad shape because a mine exploding under the tank would cause the cover to "dish" and fly up into the tank. The sprocket welded to the cover extended over its flange and prevented the cover from dishing. Newer models of tanks have a convex cover, and an explosion merely causes it to expand against the flange and not push up into the tank.

Cohen also devised a method of welding climbing spikes to the treads of the tanks. Along icy mountain trails, the movement of tanks was becoming almost impossible and very dangerous. Cohen took center guides from abandoned tracked vehicles and cut them into U-shaped pieces that would fit between the tank treads. The leg of each U protrudes about 3 in. beyond the treads, and the tanks are absolutely stopped from sliding.

Back to United States

When Captain Hackenbrach became chief of the Metalworking Branch, Aberdeen Proving Ground Ordnance School, Warrant Officer Cohen was also assigned back to A.P.G., where in preKorea days he had been chief welding instructor. He was assigned to the officers' training section of the Metalworking Branch as a welding instructor. Hackenbrach and Cohen, along with Warrant Officer Thomas B. Osborn, the present chief welding instructor, are turning out many good weldors.

The school was originally located at Raritan Arsenal, Raritan, N. J., but was moved to Aberdeen, Md., about 1940. Between 1940 and 1946 it had 15 branch chiefs, largely because of wartime transfers. Originally, the school could handle only 75 students, but in September, 1949, plans were drawn up for an enlarged staff and buildings. A shed to store a 20-cylinder manifold was built from salvage material. The manifold, installed at a cost of $11,000, eliminated the need for individual cylinders at each booth and also the annoyance of students having to change cylinders during class. Each booth is fitted with individual gages. At the same time, a new heating and ventilating system was installed; this removes welding fumes and heats the building.

From its small beginning to the present, the school has taught over 10,000 E.M. (enlisted men) and officers how to weld. Today, 30 instructors and supervisor-instructors work in two shifts, five days a week, teaching 240 students.

STUDENTS have opportunities to use the latest modern equipment. An example is this metallizing set-up

PRACTICE in repair is gained upon captured tanks. Note the row of arc-welded patches above tank treads

The first shift is from 8 a.m. to 5 p.m.; the second from 5:30 p.m. to 2:30 a.m. Each instructor has a class of ten students, who are taught from a prepared lesson plan. Instructors are required to pass an instructor training course, taught by the training standards branch, before they are qualified to teach.

What Do They Learn?

The complete welding course requires ten weeks. Students are given 50 hours of theory in the classroom, spaced at intervals between practical work. The final week is devoted to the welding of armorplate.

The graduate must be able to do arc and gas welding in all positions on steel from ⅛ to ¾ in. thick. He must be able to apply hard-facing alloys, braze weld with bronze rod and silver braze. He must know how to weld aluminum, how to weld die castings (white metal) and how to do inert-arc welding. He is taught how to use and take care of tools.

He must be able to flame-cut plates up to 2 in. thick without supervision. When he leaves the school, he must be able to weld Russian high-silicon armorplate 2 in. thick in a vertical position. Naturally, he is taught how to weld stainless steel and is given some practice with low-hydrogen electrodes.

Students have an opportunity to use the latest modern equipment. There are three heavy-duty snag grinders, a lathe for metallizing, a ¼ in. by 5 ft. metal shear and a complete tool room containing equipment not ordinarily issued.

Each student works in an individual station or booth and has his own tool box to hold gloves, chipping hammer, goggles, hood, pliers and Army welding manual (all this must be turned in at the end of the course). Each arc-welding booth has an individual welding machine installed under the table.

Every student is issued three practice coupons daily. When the student feels proficient enough as a weldor to receive a passing grade, he turns in a specimen for inspection. If the instructor feels the welding will pass, he gives an O. K. for the student to make a sample for the grading section to test. This sample is heated, quenched while hot and then placed under a power press. Fractures in the weld or surrounding area will cause rejection. Then the student must take another test, and perhaps more than one, until he does pass.

The supervisor who grades test specimens never knows a sample's owner as it is identified by a number. This eliminates any chance of favoritism and avoids hard feelings on the part of students.

A weldor is not taught symbols because of the short duration of the course. He does, however, leave as a semiskilled weldor and is classified as such. He knows how to temper, anneal, make templates, read blueprints and pipe layouts. He has learned how to cut pipe and armorplate, both by hand torch and automatic machines.

The arc-welding class has had to simulate a projectile hole in armor and repair it by fitting in a square plug with a double-vee edge preparation for inside and outside welding. This is harder to do than it looks because the Army uses scrapped Russian tanks made of high-silicon steel for the guinea pigs. All patch welding must be done in a vertical position, not too easy even for experienced weldors.

The school uses about 1,500 lb of mild-steel electrodes a month and a proportionate quantity of other kinds. Everyone here is cost conscious. For example, mill ends and stampings are purchased for the student's practice welds. When the welding class has completely covered them with welds, the oxyacetylene cutting class takes over and cuts up the welded samples into uniform scrap that brings a higher price from the mills.

The student leaves with a do-or-die anxiety to apply his knowledge. Naturally, he is not as good a weldor as he will later become with added experience. For this reason, A. P. G. tries to keep him under the supervision of a journeyman weldor (if such a journeyman is available) for at least three months before he is on his own.

Youth likes to play and E.M.'s are no exception. The instructors once caught some students playing ball in the classroom with rubber balloons. The balloons were filled with acetylene . . . fortunately nobody got hurt. It shows, though, how the instructors have to be on their toes.

Even though the fellows sometimes get too ingenious, the ingenuity taught at A.P.G. is paying out in better weldors for our armed forces.

JET tailpipe is spot welded at 68 ipm (three times former rate) as Steve Dever (left), spot weld engineer, checks weldor John Cronin

ENGINEER Robert Fullerton adjusts split-second action on new control. Air-operated control provides faster indexing and welding

Roll-Spot Technique Doubles Welding Speed

A NEW technique and modified seam-welding facilities have stepped up spot-welding speeds more than 100% and improved weld quality at the Ryan Aeronautical Co., San Diego, Calif. Spot welds on 1-in. spacings can be installed at 68 ipm in contrast to the former rate of only 21 ipm.

This accelerated performance is attained in the welding of tough stainless steels, Inconel X and W, "Stellite" No. 25 and other crack-sensitive alloys that are needed for jet-engine afterburners, variable nozzles, exhaust cones, tailpipes and other high-temperature components.

Roll-Spot Welding

For this work, Ryan is using seam welders that have been equipped with fast-indexing mechanisms for roll-spot welding. These are air-operated and electronically controlled. Two horizontally opposed bellows actuate an overriding clutch that is powered by standard air-line pressure of 80 psi. The clutch rotates the upper electrode wheel. When the operator presses a switch, the continuous seam-welding drive mechanism is detached, and the roll-spot drive takes over. The drive can be set by indicator to index in single or multiple movement and to make spot welds at spacings of from zero to five inches.

The new controls are a distinct advantage over the former drive, in which the proportion between dwell time and indexing time was a fixed ratio that depended upon the gearing and drive mechanism and could be varied in fixed increments only. The new air-operated drive provides continuous flexibility in varying ratios of dwell and indexing time.

For spaced-out spot welding, the new technique is wholly satisfactory. In spot welding a J-47 jet-engine tailpipe, Ryan makes 300 spot welds on 1-in. centers in one seam. These can be made at 68 ipm as compared to the former rate of 21 ipm under standard methods. With improvements now being developed, speeds as high as 80 ipm will be realized. The reduction in time allows five assemblies to be spot welded in the time that it formerly took to do two.

Seam Welding Also

Ryan spot-weld engineers Robert Fullerton and Fred Dever conceived another application for the new mechanism — faster seam welding. Formerly, gastight seam welds in the crack-sensitive alloys could not be formed at speeds exceeding 6 to 12 ipm. Moreover, it required a large number of overlapping spot welds to produce gastight seams. Why? Because each spot weld was inferior to that produced under static conditions. To overcome this, the Ryan technicians directed their efforts towards faster intermittent operations.

The drive was speeded up even beyond its already rapid action. Exhaust mufflers that produced less back pressure were installed. An improved air intake valve, with snappier action, was incorporated. A new type of faster meshing gearing is also being developed.

With these facilities, Ryan engineers have worked out new performance ratios, in which "dwell time" (the time when the electrodes are motionless) has been reduced to the shortest possible interval. Indexing time (the time lost in making the switch to the next spot-weld location) was also cut to the bare minimum.

Once precision control of intermittent operation was attained, it was found that better spot welds could be accomplished than under continuous operation. The spot-weld nuggets were sounder because the metal was held under forge pressure during the cooling cycle. A larger, stronger nugget was made. Holding of the sheets during cooling greatly reduced shrinkage and distortion from heat.

With sounder spot welds available, theory suggested that gaslight seam welds could be formed with fewer spot welds and at greater speeds. This has proved to be the case. For instance, on a typical afterburner assembly formed under continuous drive from two sheets of 0.045-in. Inconel W, Ryan previously had to make 11 overlapping spot welds per running inch to form certified seams. The new roll-spot technique enables certified seams with only 5½ spot welds per inch at a speed of 26 ipm.

Economically, the innovation presents an attractive picture. The new accessory drive costs about 15% of the cost of a new machine, and it is quite possible to get twice the capacity from a machine.

OVERALL set-up for welding cradle stakes built by Pacific Car & Foundry Co., Seattle. Note the flux-recovery system

Structural Steel Assembly Line

Cradles and pots sound like simple and homey things, but the familiar meanings are the wrong ones when the words are applied to an aluminum reduction plant.

BY HOWARD E. JACKSON

FAR from being a nursery device, the "cradles" that support the 568 "pots" in the Aluminum Company of America's new $50,000,000 reduction plant at Wenatchee, Wash., are steel structures weighing 800 lb each. A total of 6,248 cradles are required —eleven to each pot—representing a total tonnage of 4,998,400 lb of structural steel.

A contract for construction of these pot-supporting cradles was given to the structural division of the Pacific Car & Foundry Co., Seattle, Wash. The accompanying pictures give details in the construction.

A pot cradle has two main components: the base and the stakes. There are two stakes, one at each end of the base, which consists of two 12-in., 20.7-lb channels welded back to back. The twin channels are each 10 ft 8 in. long and are welded with spacing bars between them to hold them apart. The stakes are riveted between the double channels to support the sides of the pots. Eight 1-in. rivets are used to hold the stakes between the channels. Welded to the stakes are small brackets to support the bus bars on the pots.

Making the Stakes

Let us begin with the fabrication of the stakes. These are pieces 3 ft 9¼ in. long by 12 in. wide. They are cut from 1-in. plate on a pantograph-type flame-cutting machine with a magnetic tracer. As the magnetized wheel follows the template, two stakes are cut to shape simultaneously by the two torches (Fig. 1, page 44). The stake is triangular in shape with the "point" cut off. The long cuts are made first to get two pieces from one rectangular plate; then the ends are cut. The rate of travel is about 18 ipm, and one man can cut 100 stakes in an 8-hour shift.

The same cutting procedure is used to cut out the small brackets, which are later welded to the stakes. They are cut to shape four at a time, turning out 300 to 400 a day. The template is made ⅜-in. undersize.

The stakes are taken to an 18-ft press brake that has been set up like a punch press. Eight 1 1/16-in. holes for the rivets are punched out in one stroke, while a second stroke straightens the stake to remove any "dish" effect. Some 5,760 holes are punched out in an average day. As many as 720 stakes have been punched in an 8-hour shift.

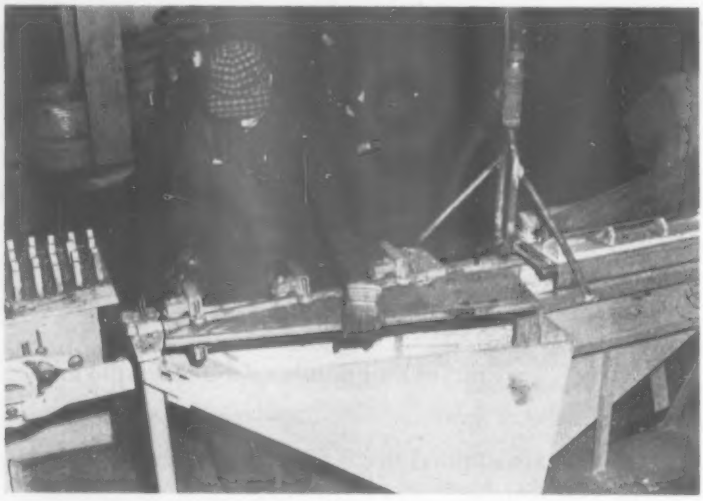
The next operations are all welding. First a 3-ft flange of ¾-in. plate is welded to the back edge of each stake to act as a stiffener; next the previously mentioned brackets are welded onto the stake.

The large picture at top shows

1—FIRST step: stakes are cut from 1-in. plate. A two-torch machine cuts out two parts at the same time

2—MAN in background is positioning the tack-welded stakes onto power-driven table for automatic welding

3—TABLE carries stake past the two automatic heads that weld on the flange



4—WELDED stake is rolled onto this counterbalanced positioner, where it is cleaned, chipped and inspected. "Breaks" are rewelded

5—BRACKETS are welded onto stake. The positioning jig can be flopped either away from or toward weldor

6—CHANNELS for base are welded back to back with spacing blocks (shown on right channel) between them

the welding production line. As the stakes come from the press brake in pallets of 24, they are picked up by a jib crane and set on a sloping table so that they can readily be slid onto a roller conveyor table. A stake is slid onto the rollers on its back edge and set upon the 3-ft flange in a jig. The flange is then tack welded to the stake at both ends and on both sides. In Fig. 2, the foreground weldor is tacking the flange to the back edge.

The stake is next rolled down the conveyor rollers to a power-driven table (background of Fig. 2), which carries it past two automatic submerged-arc welding heads (Fig. 3). These make 3/16-in. fillet welds on both sides of the narrow flange—a total of 6 ft of welding for each stake. The two opposed welding heads are staggered, one being 6 in. in front of the other, to eliminate underbead cracking. Experiment showed that if both heads were opposite each other, there is so great a heat concentration that hydrogen gases are trapped and one bead is cooler than the other. Staggering also avoids two machines being "on" at the same time.

A 5/64-in. electrode wire, and a current of 350 amp are used. Rate of welding is 3 ft 6 in. per minute. One lever, on eccentrics, controls the flux feed for both sides. One man can operate this double-headed machine and weld 1,200 lineal feet in an 8-hour shift.

The welded stake is rolled along to a counterbalanced positioner (Fig. 4), where excess weld flux is chipped off with a pneumatic scaling gun. A flux-recovery unit is used to separate the large pieces of flux, remove flour flux and deposit usable flux back in the hopper. A 5-hp vacuum tank separates the fused and flour flux from unused flux. The slag falls into a lower hopper. On the positioner, the stake is cleaned, inspected and "breaks" are hand welded. The counterbalance then flips the stake over so it is ready to be rolled forward to the next operation.

The double bus bar brackets are hand welded to the stake on a second positioning jig (Fig. 5). This jig can be flopped from side to side, away from or toward the weldor, and it is positioned to get a 3/8-in. downhand fillet, 4½ in. long, on either side of the brackets. A 5/16-in. E-6020 electrode is used.

7—OVERHEAD crane carries assembled pot cradles to waiting gondola car

After the brackets have been welded onto the stake, the assembled unit is shoved out of the rollers into a skiff (50 to a skiff) and taken by overhead crane to the assembly area. The all-welded 15-ton crane has a 35-ft craneway.

Making the Base

The channel stock for the cradle bases is kept in the yard, which has a big steel inventory of 12,496 channels in all. Half of these have been mill cut to 12-ft lengths. The other half consists of 24-ft channels that are cut in two with a friction saw. The heavy pieces go through the saw in 13 seconds and leave on huge rollers. The burrs are cut off with a pneumatic chipping gun, and the channels are then picked up by overhead crane and taken to the storage yard. When needed, they are taken to the building on four-wheeled rail trucks that are pushed by a fork lift truck.

A load of 144 12-ft channels is stacked next to the previously mentioned 18-ft press brake, and the channels are fed to the brake one by one on a roller conveyor. The same die set-up is used as for punching out the holes in the stakes. One end of the channel is punched with a group of 8 holes; then the stop pin is pulled out, and the channel is pushed to the next stop so that the group of eight holes can be made in the other end. The punched channels are taken by crane to the assembly area, where they join the stakes.

Two channels are welded together back to back. First, however, spacing bars are welded to the back side of one channel. In Fig. 6, the spacing blocks have been welded to the back side of the channel at the right. The welding on the channels is all manual arc, using 7/32-in. E-6013 electrodes and a d-c welder set at 350 amp. Here, as elsewhere, roller conveyor tables facilitate handling.

The stakes are riveted between the double channels by means of a huge bull riveter. One stake is riveted at each end of each channel. This completes the assembly of the pot cradles. They are lifted up in groups of five by overhead crane (Fig. 7), and carried out the end of the building to be loaded into gondola cars. Some 90 cradles are welded and assembled a day. At present writing, the finished cradles are being shipped to Wenatchee in 118,000-lb carloads every two days. The job site has eight buildings, and there are 71 aluminum reduction posts per building. With 11 cradles to the pot, there are 781 cradles to a building or a total of 6,248.

"Stop Logs" for Coulee Dam

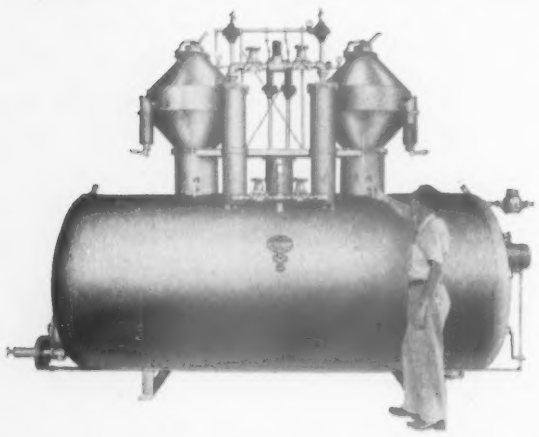
The Pacific Car & Foundry Company's structural division fabricates products on both a job-shop and a mass-production basis. Its more usual products include steel-frame buildings, I-beams, roof trusses, bridges, towers, lintels and other items. A more unusual job, however, was the turning out of 420 tons of "stop-logs" for Coulee Dam.

These are among the largest weldments ever fabricated in the Seattle plant. The 26 all-welded stop-logs are each 20 ft wide and vary in height from 2 to 13 ft. When stacked in place, they form a watertight barrier 277 ft high.

There are four different sizes. The ten units for the lower tier weigh more than 18 tons each, and the three for the top tiers more than 10 tons each. Each unit consists of five main structural members, ranging from 21-in., 68-lb WF beams in the top units to 36-in., 300-lb WF in the

designed for

modern acetylene production



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WELDING *Sight Feed* EQUIPMENT

THE SIGHT FEED GENERATOR CO.
WEST ALEXANDRIA, OHIO, U.S.A.

lower tier. The center diaphragms connecting these members were built in separate jigs, where tolerances were held to 1/32 in. Connecting plates 1⅛ in. thick were welded to the underside of the flanges of the main members to form the downstream or watertight side of the stoplogs. Specifications called for ½-in. continuous fillet welds.

The cover plates on the upstream side were ⅝-in. plates welded with ⅜-in. fillet welds 3 to 6 in. long. The end plates were ⅝ in. thick, and welded with ½-in. fillets, including double-fillet welds to the webs of the main members. The side main members were welded with ⅜-in. continuous fillets. Finally, all the parts for a unit were assembled and welded in jigs. There were approximately 1,000 ft of welding on each unit.

The Bureau of Reclamation specifications called for close tolerances. When suspended by U-bolts, the vertical seals must not vary more than 3/16 in. from a straight line. The surface of the plane formed by the base seal and the vertical seals must not vary more than ⅜ in. on the diagonals. Because of those close tolerances, it was necessary to set up jigs and an assembly line. About 25% of the welding was completed in the jig, 75% in the assembly line.

For the upstream side, manual arc welding procedures were employed, using 3/16 in. E-6010 and ¼ and 5/16 in. E-6012 and E-6020 electrodes. For the downstream or watertight side of the "log," however, more than 200 ft of continuous ½-in. fillet welding had to be done. Advantage was taken of the company's gantry automatic welding machine, which consists of a 1,200-amp submerged-arc welding head mounted on a 40-ft gantry beam. The beam is adjustable to a height of 12 feet.

By means of push-button controls at the welding head, the welding operator is able to move the gantry to any position. The log unit was placed under the gantry head at a 30-deg angle, and the automatic head operated at an angle of 15 deg. A perfect ½-in. fillet weld resulted in one pass. A sound, smooth weld was obtained. Welding conditions were 980 amp at 33 volts, travel speed of 15 ipm, 7/32-in. electrode wire. The unused flux was reclaimed by means of a vacuum pick-up that travels with the head.

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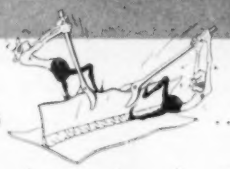
minimize stress  ...distortion ...warpage with Low Temperature EUTECTIC WELDING ALLOYS

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"Having just completed a series of tests using EUTECTIC's rods on Terne Plate tanks, I thought you would be interested in the following typical results.

TIME SAVINGS PER 100 TANKS!

Airtack and weld complete..43.7%
Wire Brush welds.....18.6%
Test and Repair leaks.....32.6%

"This reflects a savings of 43.85 hours (40%) per 100 tanks. The comparisons were made on production runs and the hours per 100 tanks shown are actual time study standards used for incentive purposes.

"I wish to thank you for the splendid cooperation which made this savings possible." —*L. L. D., Ind. Eng., Stolper Steel Products Corp.*

EUTECTIC WELDING ALLOYS CORPORATION
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WE-2

This new manual of yours sounds like a very helpful book. Send me a FREE copy with the understanding that there will be no cost or obligation now or later.

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1—POSITIONER turns piston to receive new surface

2—HAND screw moves the welding gun horizontally

Inert-Arc Build-up on . . .

3—CAPS at ends are added by submerged-arc welding

4—PISTON works in control cylinder of "Payloader"

. . . Pistons for "Payloaders"

ONE OF the most useful ideas that the mechanical genius of Man ever hit upon is the simple piston-and-cylinder combination. It was discovered early (maybe about the time of the first steam engine) that when a steel piston works inside a steel cylinder, they both tend to wear out rather fast. To secure a satisfactory run, the piston must either: *(a)* be of softer metal or *(b)* have a layer of softer metal over it. Method *(b)* is usually preferred because the ductility and toughness of mild steel are needed for the core of the piston.

OLD METHOD: ARC WELDING

Confronted with this old problem in piston building, The Frank G. Hough Co., of Libertyville, Ill., was arc welding an aluminum-bronze alloy over the surface of a mild-steel piston. It was a slow operation, and rejects tended to be rather high because of porosity in the deposited metal. To secure a porous-free layer of surfacing metal, the company turned to inert-gas metal-arc welding, using an electrode wire of Everdur (silicon bronze). Rejects dropped, and production took an upward turn.

The pictures tell how it's done. The piston is clamped at one end to the faceplate of a welding positioner (Fig. 1), while the other end rests upon turning rolls. The welding gun, which feeds the wire automatically, is clamped into position above the work. A hand screw moves the welding gun horizontally (Fig. 2) to permit progress down the length of the piston. Three passes are needed to secure a ⅛-in. thickness of Everdur in the built-up areas.

About seven types of pistons, varying from 4 to 6 in. in diameter, are treated in this manner. Not all of the piston is resurfaced but only selected areas. Some of the built-up areas are ½ in. wide, others are 4 in. A group of built-up pistons is pictured in Fig. 3. Submerged-melt welding is used to weld the caps and hold-down ends to the cylinders.

The pistons fit into hydraulic cylinders, which control the hoists and buckets of Hough "Payloaders" (Fig. 4), a well-known earth-moving vehicle.

Photographs and data courtesy of Linde Air Products Co.

The U. S. Steel Supply team that gives you *personalized service*

...our salesman

puts this team to work for you!

SUPPLYING YOUR STEEL requirements becomes our team objective when you tell your needs to your U. S. Steel Supply salesman. Behind your salesman is a team of technical experts, each one a specialist in his field . . . and your business receives the attention of every member of the team who can contribute to its progress.

What do you need? Steel? Tools? Special purpose equipment or machinery? Advice on working an unfamiliar type of steel? Help in meeting a pressing delivery date? Give your order to your U. S. Steel Supply salesman. He will see that it gets immediate attention from the U. S. Steel Supply specialists best qualified to serve you.

YOUR "ONE CALL" SOURCE OF STEEL SERVICE

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USS

UNITED STATES STEEL

Salesman Turns Sleuth... Solves Welding Riddle

TROUBLE struck a large Midwestern company producing supply tanks for Naval Ordnance hydraulic systems. Pin holes were appearing in welds joining fittings to the tanks.

The M&T sales engineer, called in to assist, ran many tests—discovered that fittings and tanks were of stainless steel of different chemical content. Tanks were made from 10 gauge columbium -modified 18-8, but fittings had been machined from selenium-bearing stainless to secure better machining properties.

RECOMMENDED: Use of Murex lime-coated stainless electrodes in place of titanium-coated electrodes to prevent formation of gas in welds involving the selenium steel.

RESULT: Porosity arrested—production resumed—Case Closed!

Your nearby M&T representative is qualified to give genuine assistance on any welding problem. Call on him when you need help. Make use of his broad background of experience in every phase of welding.

MUREX®

Electrodes

Arc Welders • Accessories

METAL & THERMIT CORPORATION 100 East 42nd Street, New York 17, N. Y.

Induction and Dielectric Heating— Physical Constants of Metals

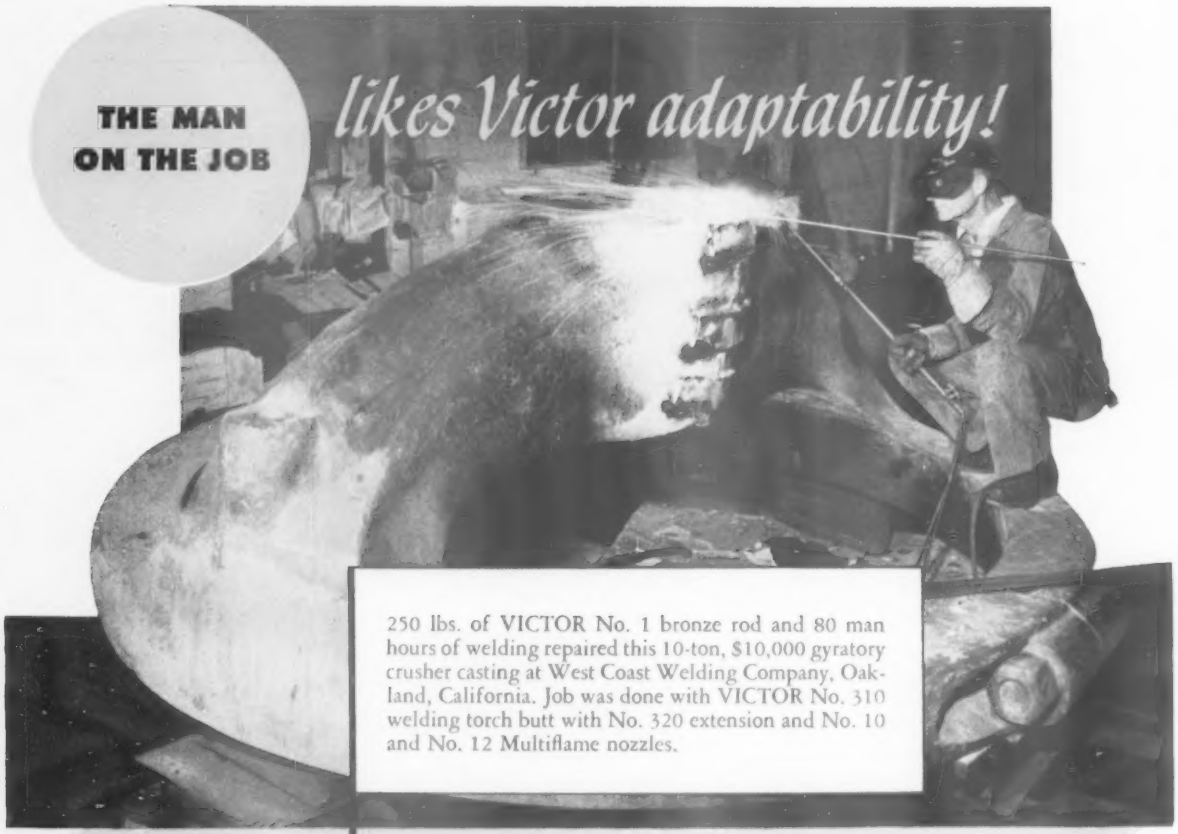
(20 C [68 F] unless otherwise specified)

Material	Resistivity, Microhms per cm	Temperature Coefficient of Resistance	Specific Gravity	Specific Heat	Coefficient of Thermal Conductivity
Aluminum	2.688	0.00403	2.70	0.214	0.5
Barium	9.8	0.0033	3.78	0.068	——
Beryllium	10.1	——	——	0.397	——
Brass	8	0.002	8.6	0.092	0.204
Bronze	17.8	0.0005	8.8	0.086	——
Carbon	3,500 at 32 F	0.0009	3.52	0.165	——
Calcium	4.59	0.00364 (0-600)	1.54	0.157	——
Chromium	2.6 at 32 F	——	6.92	0.11	——
Cobalt	9.7	0.00658 (0-100)	8.71	0.10	——
Copper	1.724	0.00393	8.89	0.0921	0.918
Gold	2.44	0.0034	19.3	0.0312	0.7
Graphite	800 at 32 F	——	2.25	0.17	——
Iron	9.8	0.0065 (0-100)	7.8	0.107	0.161
Iron, cast	79-104	——	7.03	0.118	——
Lead	22.0	0.0039	11.4	0.0306	0.083
Magnesium	4.46	0.004	1.74	0.246	0.376
Manganese	5	——	7.42	0.121	——
Mercury	95.8	0.00089	13.59	0.033	0.015
Molybdenum	5.08 at 32 F	0.0047 (0-100)	9.0	0.065	0.346
Monel metal	42	0.002	8.9	——	0.062
Nickel	7.8	0.00537 (20-100)	8.9	0.105	0.142
Platinum	9.83 at 32 F	0.003	21.4	0.0324	0.166
Potassium	6.1 at 32 F	0.0055 at 0	0.851	0.19	——
Silver	1.629 at 64 F	0.0038	10.5	0.056	1.0
Sodium	4.3 at 32 F	0.0054	0.951	0.295	——
Steel (soft)	11.8	0.004	7.7	0.118	0.115
Steel (hard)	45.6	0.0016	7.7	0.118	0.115
Steel (nickel)	30-85	0.0007	7.7	0.118	0.115
Tantalum	15.5	0.0031	16.6	0.036	0.130
Thallium	17.6 at 32 F	0.0040 at 0	11.86	0.038	——
Thorium	18	0.0021 (20-1,800)	11.5	0.027	——
Tin	11.5	0.0042	7.3	0.054	0.155
Titanium	50-153	——	4.32	0.142	——
Tungsten	5.5	0.0047 (0-100)	19	0.034	0.476
Zinc	5.75 at 32 F	0.0037	7.1	0.093	0.265

Note: Data compiled by the Industrial Electronics Division, Westinghouse Electric Corp., Baltimore, Md.

THE MAN ON THE JOB

likes Victor adaptability!



250 lbs. of VICTOR No. 1 bronze rod and 80 man hours of welding repaired this 10-ton, $10,000 gyratory crusher casting at West Coast Welding Company, Oakland, California. Job was done with VICTOR No. 310 welding torch butt with No. 320 extension and No. 10 and No. 12 Multiflame nozzles.

Whatever the job . . . welding, cutting, heating, brazing, descaling . . . you'll start it quicker, finish it sooner with versatile VICTOR equipment.

Here's why:

- HAND-TIGHT QUICK-CHANGE nozzles and cutting attachments are on or off with a twist of the wrist —no wrench needed!
- STEADY FLAME—set VICTOR torch ball-point control valves to the flame you want and it *stays!*
- EFFICIENT MIXING in VICTOR'S exclusive spiral mixer and gas proportioner means peak performance at every setting, with every type of VICTOR nozzle.

LOOK FOR THE VICTOR DEALER SIGN

Ask him to show you why it *pays* to standardize on VICTOR.

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Welding and Cutting Equipment Since 1910

GET THE FACTS—AND YOU'LL GET VICTOR

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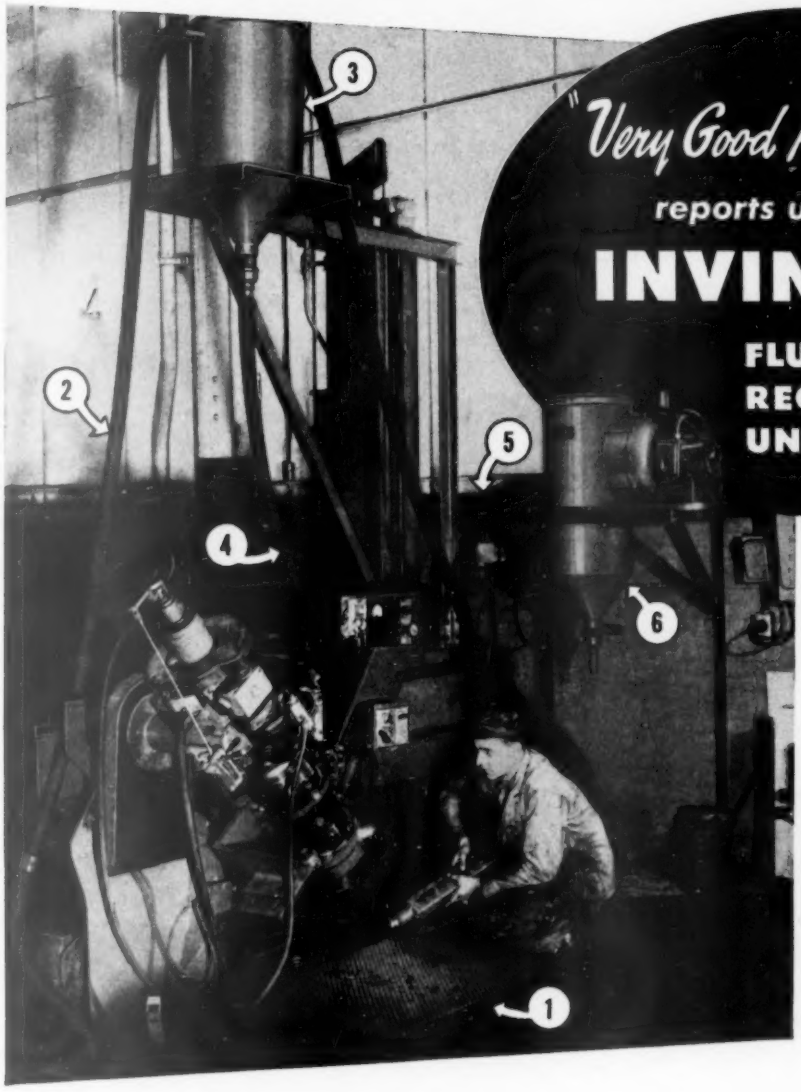


"Very Good Performance"

reports user of this

INVINCIBLE

FLUX RECOVERY UNIT

OPERATION KEY

1. Unfused flux falls through screen to hopper below floor.
2. Recovery Hose draws flux up to Primary Separator Tank,
3. which separates usable flux from slag and fine dust.
4. Usable flux returns via this hose to hopper of welding head.
5. This hose connects Primary Separator to Vacuum Producer.
6. Invincible Model 482, the Vacuum Producer for the entire system.

The Euclid Road Machinery Co.—a pioneer in the manufacture of off-the-highway earth moving equipment — operates this Invincible system to reclaim flux on submerged arc welding. The Invincible unit operates automatically, recovering all unfused flux and returning it to the hopper of the welding head in a continuous flow . . . The mechanism on which the primary separator tank and welding head are mounted can be raised or lowered to accommodate various welding positions. Even when the tank is elevated 18 feet above the floor, the Invincible unit operates efficiently. This setup truly demonstrates the flexibility of location that is possible with an Invincible system . . . Also by removing all fine dust (flux flour that often causes porosity in the weld) this Invincible installation helps prevent rejects and speeds welding production.

Available in many sizes and types, the complete line of Invincible Recovery Units offers the right model for every kind of submerged arc welding job . . . To apply the equipment to your needs, Invincible's unexcelled experience in this specialized field is at your service.

FREE FOLDER on Flux Recovery describes and illustrates the complete Invincible line . . . Send for your copy now.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO
FOR 40 YEARS, LEADERS IN INDUSTRIAL VACUUM EQUIPMENT

new era in welding!

A. C. WELDING MACHINES

Heavy-Duty CHAMPION

300-, 400- and 500-Amp. Production Welding Models. The extra years of service built into these machines make these models real welding champions.

The CHALLENGER

200-, 300- and 400-Amp. Production Welding Models featuring wide amperage range for adaptability to more jobs in any production welding shop.

The AUTO-MAN

650-Amp. Model. For Automatic or Manual Operation, singly or in multiple set-ups. Offers unusual flexibility for your welding requirements.

The UTILITY

An all-purpose Utility welder with 25 to 180 Amp. range for repair-shop, maintenance and farm use, and featuring production welder construction.

Made by Welders . . . for Welders

Production proved by one of the world's largest users of welding products

Now A. O. Smith advanced design... new plus features... give you the latest in welding machine efficiency

D. C. WELDING MACHINES

The D. C. RECTIFIER

200-, 300-, and 400-Amp. heavy-duty Production Welding Models for all d.c. jobs. The *one* rectifier-type welder designed to eliminate stack failure!

The FIELD KING Gasoline-Engine

200- and 300-Amp. Models. The most advanced of all engine-driven welding machines! Built for rugged jobs in the field. Welds with new speed and ease.

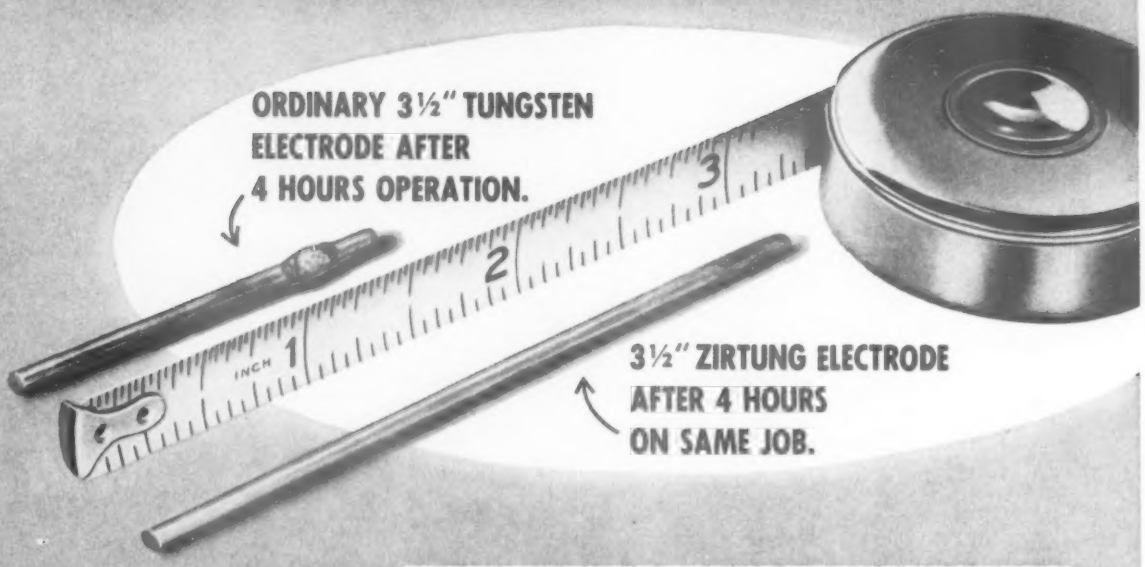
Redesigned to match *today's* welding requirements, *A. O. Smith advanced design welders* offer you the advantages of improved construction, top welding performance, and more operating benefits. A. O. Smith welders put you in the best position to cope with today's requirements and costs. Whether your welding is manual or automatic, A. C. or D. C., A. O. Smith welders assure you of having the finest power source available anywhere.

Ask your A. O. Smith representative, your A. O. Smith distributor or write us, for full details about these advanced design welding machines. *They merit your study.* A. O. Smith Corporation, P. O. Box 584, Milwaukee 1, Wisconsin.

A.O.Smith

WELDING PRODUCTS

ZIRTUNG Beats 'em all



ZIRTUNG STANDS OUT BECAUSE IT *STANDS UP!*

Far outlasts ordinary tungsten electrodes!

The photo tells the story! The ordinary tungsten rod lost 2 inches in four hours. But ZIRTUNG, on the same job in the same time, lost *only ½ an inch!*

An exclusive Sylvania Development

This time-saving, money-saving rod is an amazingly improved tungsten-zirconium alloy, developed exclusively by Sylvania for inert gas electric arc welding. Operates in the same current ranges as thoriated tungsten. And it contains no radio-active material.

You'll find Zirtung great for mild steels, aluminum and magnesium. So order Zirtung today! Your nearest Sylvania Welding Distributor is the man to call. He also handles Sylvania pure tungsten and thoriated tungsten electrodes. For further information address: Sylvania Electric Products Inc., Dept. 3T-4302, 1740 Broadway, New York 19, N. Y.

Why Zirtung Saves Time and Money

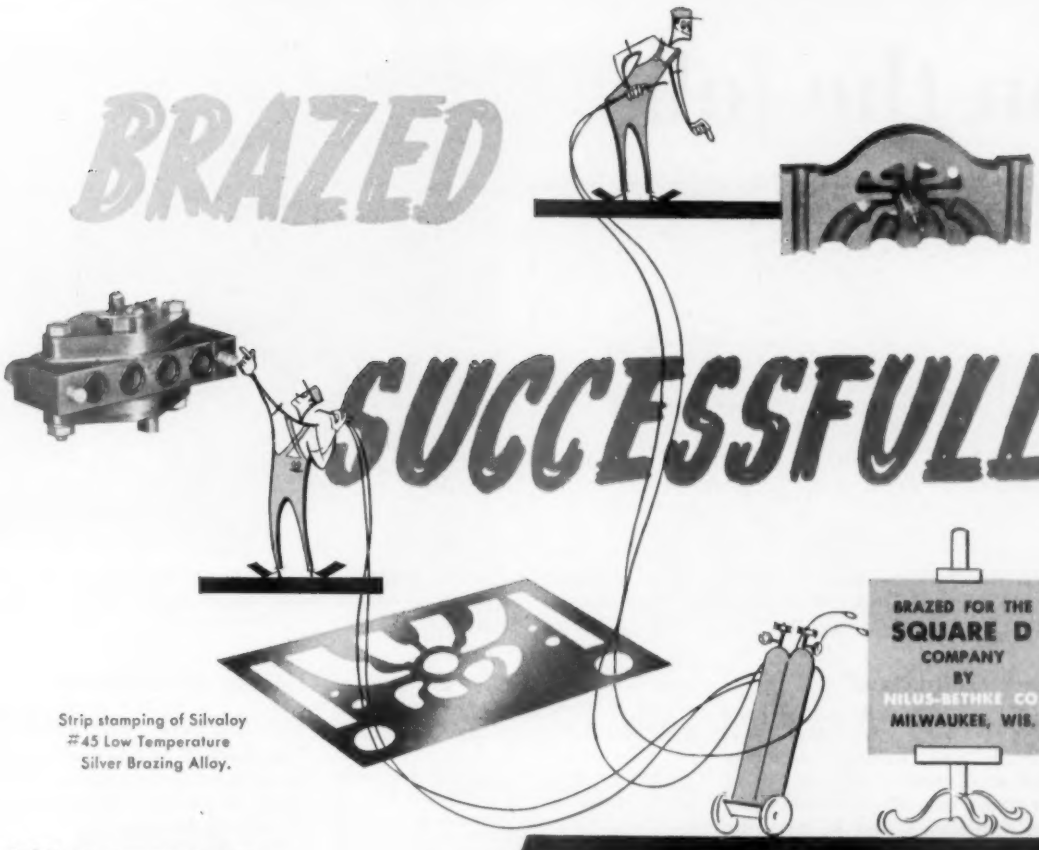
1. **Greatly reduced electrode consumption.**
2. **Far less contamination from material being welded.**
3. **Self cleans contamination without loss of electrode.**
4. **Greater arc stability.**

SYLVANIA

TUNGSTEN & CHEMICAL PRODUCTS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXTURES, LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS

BRAZED SUCCESSFULLY WITH . . . SILVALOY

LOW TEMPERATURE SILVER BRAZING ALLOY



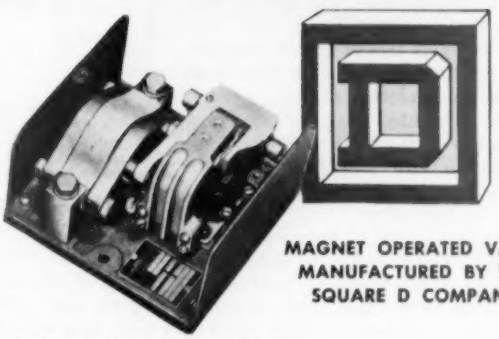
Strip stamping of Silvaloy #45 Low Temperature Silver Brazing Alloy.

The Magnet Operated Valve manufactured by the Square D Company is an outstanding example of engineering and manufacture. Metal of the precision cast valve body halves, selected for best operating results, is manganese-aluminum bronze . . . a difficult material to braze.

To braze manganese-aluminum bronze on a production basis is a complicated problem. When production brazing must meet Square D standards, it takes the best skill, silver brazing alloy and flux to do the job.

It is being done—successfully—by Nilus-Bethke Co., using Silvaloy #45 Silver Brazing Alloy in strip stampings and APW Aluminum-bronze Flux.

For the best low temperature silver brazing alloys, call the Silvaloy Distributor in your area. They'll also be glad to send Silvaloy Technicians to assist in developing lowest cost —highest production in your brazing department. ★ ★



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THE SILVALOY DISTRIBUTORS

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THE AMERICAN PLATINUM WORKS

APW

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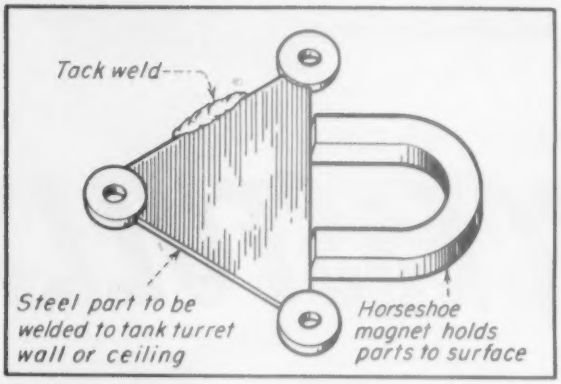
on the job



YOU DON'T need a man for holding when an Alnico magnet will do the job. But keep arc away from magnet!

ARNE KAINU, owner of Arne's Welding Service, places his card (shown below) on a logging truck he repaired

Magnet "Third Hand"

By Andrew Vena

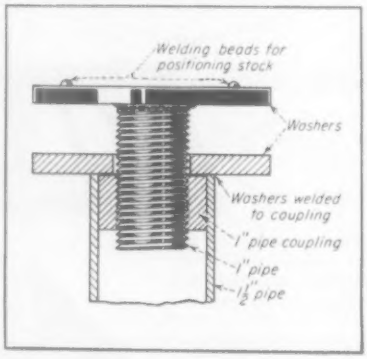
WHEN I was welding variously shaped small parts to the interior of Army tanks, on vertical, overhead or sloped surfaces, I had to have the set-up man *hold* the piece "by hand" in exact position for tacking. A tank and turret, with its myriad projections and cramped quarters, is not a comfortable place for a crew of men to work in, even if you're only trying to hold one small fitting against the ceiling. You get in each other's way; your hand slips, and the piece gets tacked out of true; hot slag spatters and burns your skin or sets your clothes afire.

What I wanted was something non-human to do the holding. I found the answer in two powerful horseshoe magnets, which I bought at an Army-Navy surplus store.

The sketch shows how we use the magnet "third hand" to hold small parts in exact position until I can tack weld them. This particular part is a 4-in. triangular plate with a threaded button at each corner. On heavier pieces, we use two magnets. Welding should be done as far away from the magnet poles as possible to avoid "arc blow." The arc is magnetic and will "answer" to the pull of the magnet. Immediately after the piece has been tacked, the magnet should be removed to avoid heating it and removing the magnetic property. Don't strike an arc on the magnet!

The magnet should be kept painted to insulate it somewhat from the heavy welding current. This could have a disastrous effect on the magnetism if allowed to flow through the horseshoe.

* * *



Bench Pipe Jack

By Harold Dettmann

EXTENSIVE shimming and blocking of the pipes and fittings going into fabricated welded assemblies have been eliminated by an adjustable bench pipe jack that I designed for the Allis-Chalmers Manufacturing Co., Milwaukee.

The jack (see picture) is made from 1-in. pipe, a pipe coupling, a 1½-in. pipe and two washers. A 1-in. coupling is cut to a length of about ½ or ⅝-in. and tapped all the way through with a 1-in. pipe tap to make a straight thread. The 1-in. coupling fits snugly inside the 1½-in. pipe. The 1-in. pipe is threaded for the full length with a straight thread, permitting it to turn freely inside the coupling.

This jack is also suitable to position slip-on flanges.

Rolling Advertisements

By Lon Fanald

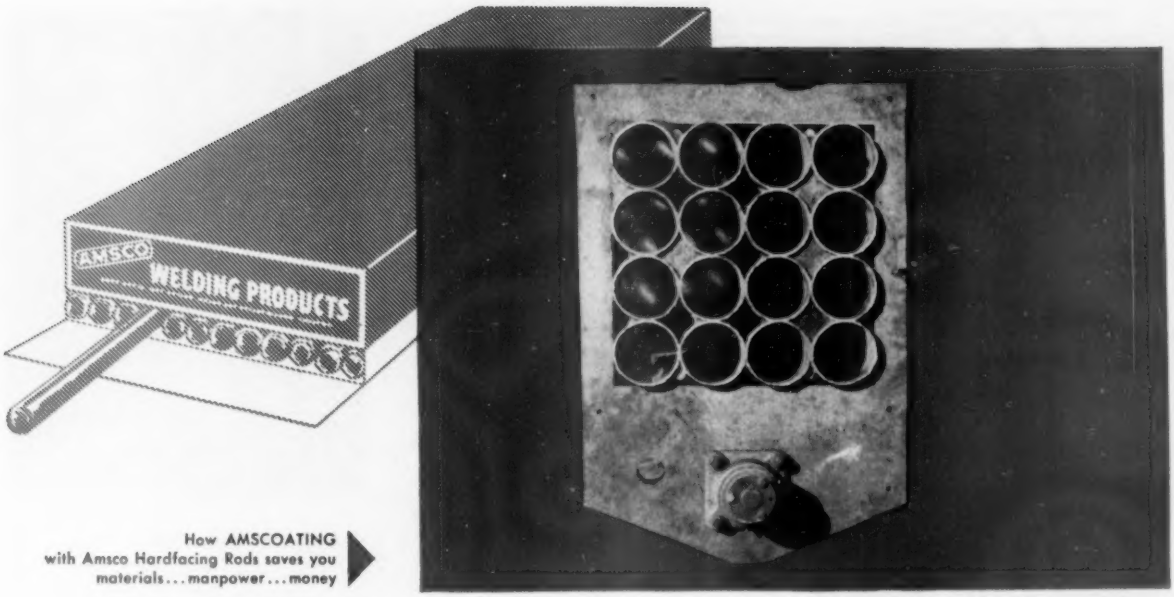
THE COST of printing 500 cardboard cards boosted the volume of business 50% for Arne's Welding Service, of Woodland, Wash.

The card (reproduced herewith)

PORTABLE
WELDING
ACETYLENE - ELECTRIC
CHEVRON PRODUCTS - COMPLETE REPAIRING
ARNE'S SERVICE
Phone 150-J
Pacific Hiway **Woodland, Wash.**

was of fairly heavy cardboard, measuring 9 by 7 in. Whenever a repair job was completed, Arne Kainu, proprietor of Arne's Welding Service, would place one of these cards on it in a conspicuous place. The card gives the name, address and telephone number of the shop and stresses that it has portable arc and oxyacetylene welding equipment available for a complete repair service.

"At first I asked permission to place my cards on trucks and other wheeled equipment that I repaired," said Mr. Kainu. "No one objected. Soon I had 300 of these cards out. Then things began to happen. I was surprised at the number of people who brought in jobs and told me that they had seen my card on so-and-so's truck. Within three months after I had put out the cards, my volume had increased 50%."



How AMSCOATING with Amsco Hardfacing Rods saves you materials... manpower... money

Amscoating these briquette machine dies increases die life... reduces need for repairs

How to AMSCOAT briquette machine dies

This procedure sheet gives complete details... the Amsco electrode to use and method of application. Also lists recommendations for other iron and steel applications. Free copy on request.

A big reduction in costs of die maintenance has been made by Amscoating with Amsco Economy Hardface "C," according to the welding superintendent of a southern plant manufacturing ferro silicon briquettes.

By using 100-110 amperes reverse polarity and depositing one pass of Economy Hardface "C" on edges of both sides of die, the need for repairs was substantially reduced.

Amsco Economy Hardface "C" is preferred because of its better service results and because of its better handling during application than types of rods used previously.

Long service life and fewer replacements through the use of Amscoating on applications means big savings. If you have equipment that is subject to wear, the possible savings to you are too big to be overlooked!

Write today for illustrated catalog—and nearest distributor's name.

AMSCOATING

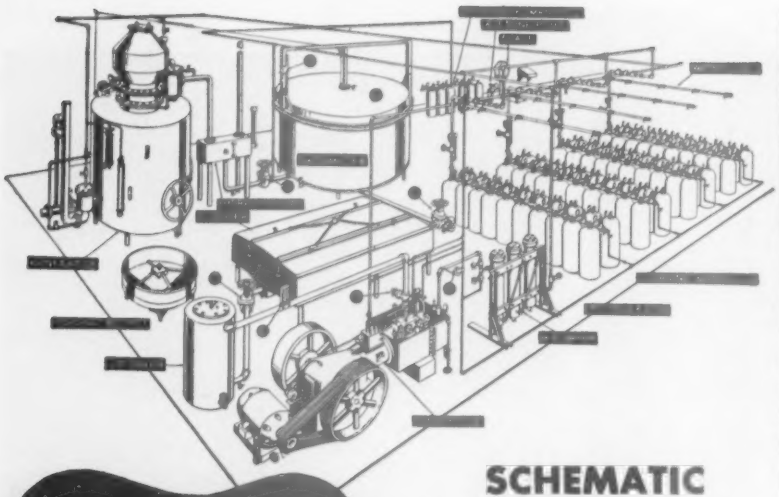
THE RIGHT WAY TO MAKE REPAIRS

American Brake Shoe Company

AMERICAN MANGANESE STEEL DIVISION

382 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.



A *Low Pressure*
ACETYLENE
PRODUCING
PLANT
that Charges up to
160 CYLINDERS
at ONE TIME

SCHEMATIC PLANT ASSEMBLY

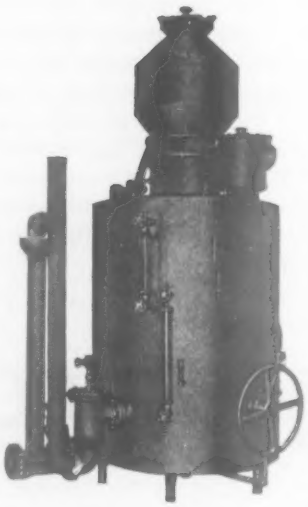
SHOWING LOCATION OF UNITS THAT MAKE UP THE PLANT

This plant layout provides simplest operation at low production costs. Compact design allows operator to watch all operations at all times.

LOW PRESSURE

GENERATOR

This 600-lb. acetylene generator fits into the above plant assembly. It stands out as one of the safest plants manufactured. Automatic controls minimize operating personnel. Rated capacity of the generator and plant assembly is 2700 cu. ft. per hour. The other units are designed for maximum production at minimum costs.



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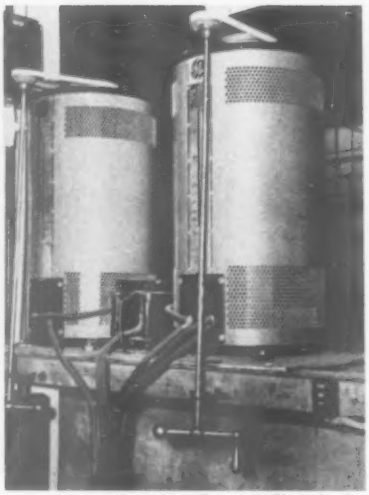
INDEPENDENT ENGINEERING COMPANY, Inc.
Manufacturers of
CONSULTING · RESEARCH · DESIGNING
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
O'FALLON 5, ILLINOIS



Courtesy General Electric Co.

Off-Floor Mounting

BY MOUNTING six transformer-type arc welders at a height of eight feet, the Huber Mfg. Co., of Marion, O., saves floor space and keeps the welding equipment cleaner. The welders are controlled by a pulley and shaft mechanism that enables the weldors to make their current adjustments from below. It is working out very well, according to Myron C. Gibson, welding superintendent for Huber.

* * *

Tinning Dirty Surge Tanks

*By G. Bethel**

SOME copper surge tanks used on passenger buses developed deep cracks around the fittings and bolt holes. Repair by conventional methods failed. It was difficult to tin successfully, owing to the layers of paint, oxides and corrosion that remained even after wire brushing. To surmount these difficulties, a new filler rod developed for soldering applications was used in conjunction with a special flux. The unusual wettability of this flux and its ability to remove impurities and surface oxides, permitted the tinning of the area to proceed at high speed.

The heat used was a combination of city gas and compressed air. The flame cone was kept in constant motion about 2 in. from the work to prevent a local heat build-up, and the tinning was accomplished by rubbing the copper surface with the alloy rod. After tinning, cracks were sealed completely by successive passes with the same alloy. Excess flux was removed with a dry cloth. The speed of application made it possible for the buses to be returned to service in less than a day.

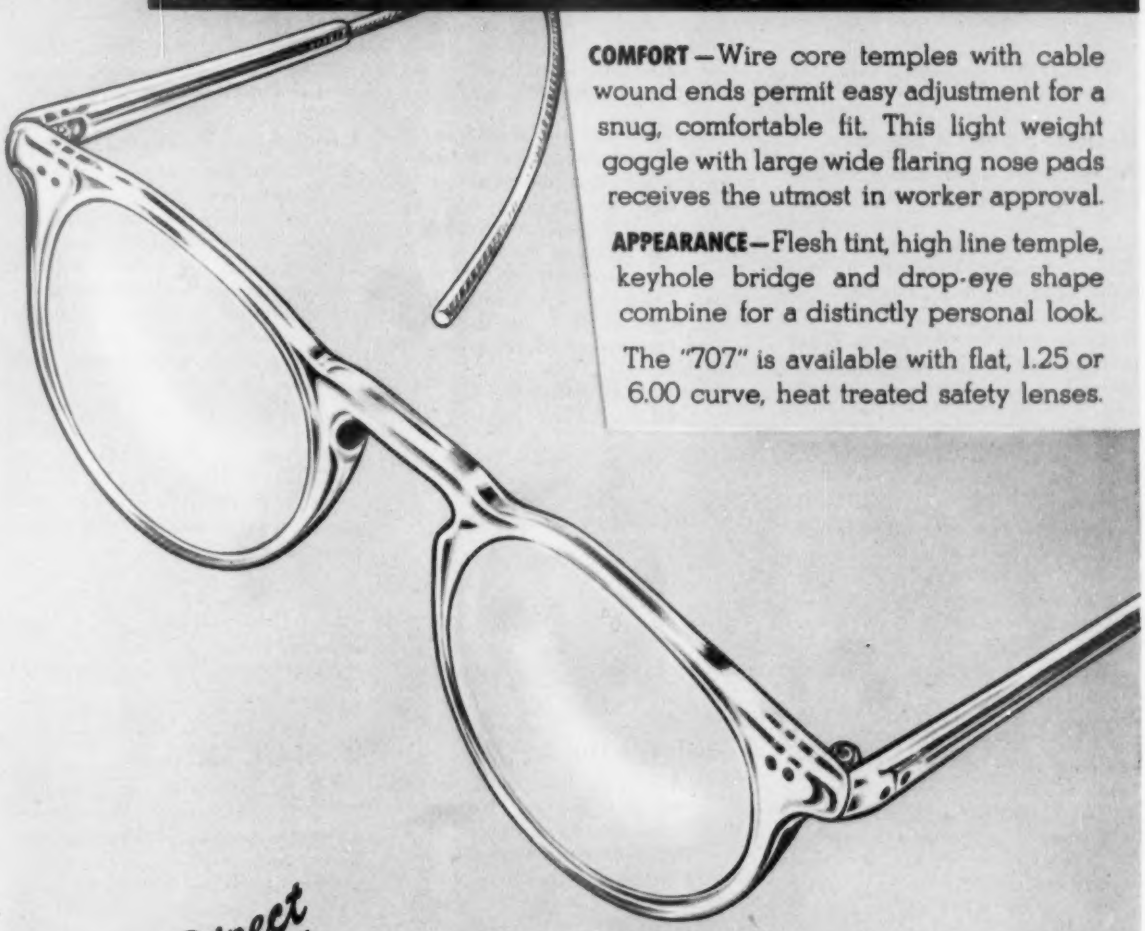
**District engineer, Eutectic Welding Alloys Corp.*

The new plastic "707" Safety Goggle combines

Protection — Comfort — Appearance

PROTECTION — is still the basic purpose of this new style goggle. Its acetate frame has been designed to retain the safety lens even when subjected to severe impact. In addition to its general use throughout industry where eye hazards are encountered, the non-sparking "707" is especially suitable for use in chemical and electrical plants.

MODEL 707 PLASTIC FRAME SPECTACLE TYPE SAFETY GOGGLE



COMFORT — Wire core temples with cable wound ends permit easy adjustment for a snug, comfortable fit. This light weight goggle with large wide flaring nose pads receives the utmost in worker approval.

APPEARANCE — Flesh tint, high line temple, keyhole bridge and drop-eye shape combine for a distinctly personal look.

The "707" is available with flat, 1.25 or 6.00 curve, heat treated safety lenses.

Order Direct and Save!

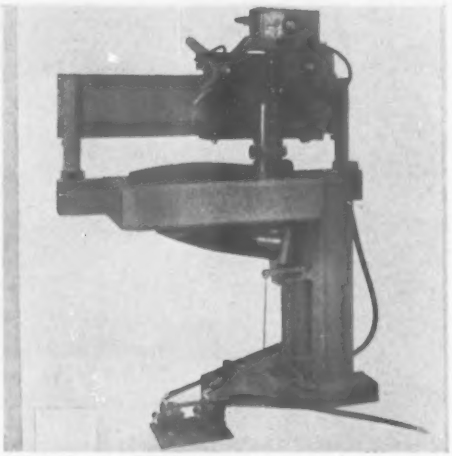
PENNSYLVANIA OPTICAL COMPANY

READING, PENNSYLVANIA

Known for Fine Ophthalmic Products Since 1886

New Products . . .

SIMPLIFIED hydraulic controls and two adjustable electrodes feature a new bench welder. Top electrode follows through fast



TANKS, BOMBS and other armaments can be production welded on inert-arc fixture

Bench Spot Welder

250 A NEW spot welder of functional design was developed to weld intricate assemblies on vacuum tubes and similar precise parts. The electrode holders are hydraulically operated. A flexible tube connects the small light piston on the top electrode with the foot pedal. A separate foot switch is supplied and can be used as an interlock so that even though the electrode tips are together and the pressure switch points are closed, a weld cannot be made until the foot switch is pressed.

Pressure of the electrodes on the work, at the time of weld, is read on a hydraulic gage which also acts as a pressure-operated switch. A movable secondary hand on the gage sets the closure pressure of the switch from 2 to 60 psi.

The bottom electrode is mounted on an insulated plate which can be adjusted in or out and is in turn fastened to a table which is easily adjusted radially or vertically. This makes for maximum versatility under varying conditions with a minimum of electrode tips. Matched pairs of electrodes are not needed, it is said, as are required for welders having the bottom electrode holder fixed.

The mass of the movable electrode is small and its ability to follow through and maintain pressure during the weld is said to cut down on expulsion. A closely coupled welding transformer provides ample power and regulation. For lighting convenience on close work, a shielded lamp is built into the welder.

For welding work away from the welder, a pair of electrode holders on flexible leads are available. Some dimensions include vertical stroke of ram, 1¼ in.; maximum distance between electrode holders, 6¼ in.; overall height, 18 in.; overall depth, 18 in.; overall width of welder 10¼ in. The power transformer is single phase, 234 volts, 3 kva intermittent duty. A handswitch on the transformer case makes 18 different heats available.

STEWART ENGINEERING CO., Soquel, Calif.

* * *

Cobalt-60 Holder

251 A NEW shielding container for the shipping and storage of Cobalt-60 radioactive sources has an outer shell of ⅜-in. malleable iron filled with lead. It holds up to 800 millicuries of activity for industrial radiography purposes. Weight of the container is 150 lb; it is 10¾-in. high.

TRACERLAB, INC., Boston 10, Mass.

INFO-AID CARDS

on pages 17-18 filled out with item numbers of products catching your eye, will bring you additional information about them.

Inert-Arc Welding Jig

252 MANUFACTURERS of tanks, tubing, fire extinguishers, aircraft and guided missile components are discovering the extreme usefulness and versatility of a new inert-arc welding jig. It was thoroughly tested in the stainless steel dairy equipment field before its military service.

It consists of a pneumatic work-clamping jig, a motor-operated welding carriage and inert-arc welding head. The carriage is adjustable for welding speeds ranging from 4 to 60 ipm. The welding head is suitable for welding any type of longitudinal seam. An inert-arc spot-welding head can also be fitted onto the jig.

Range of material can vary between 28 gage and ½-in. plate. Pressure is also variable for different jobs.

MCHALE MFG. CO., Los Angeles 23.

* * *

Welding Curtains

253 IMPREGNATED, flame-resistant canvas curtains and blankets for making inexpensive welding booths screen off arc flash, splatter and flying chips. The curtains are made to individual requirements from 8, 10 or 12 oz duck and from Underwriters grade asbestos cloth in sizes up to more than 100 sq ft.

Sturdy, firmly fastened brass grommets are fitted in one long side. All edges are hemmed and seams are double row stitched. Blankets are made with grommets in each of the four corners.

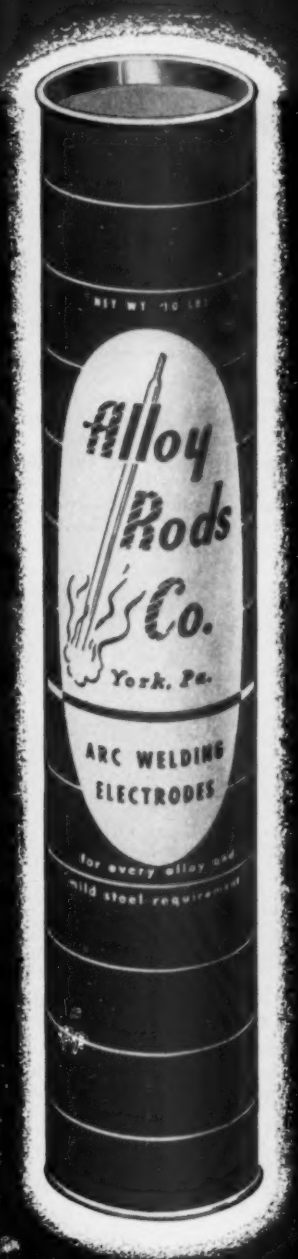
EASTERN EQUIPMENT CO., INC., Willow Grove, Pa.

Welders everywhere will tell you there are NO FINER ELECTRODES MADE ANYWHERE!

ARCALOY stainless steel electrodes for every stainless steel welding requirement. Lime coating for all-position welding, reverse polarity. AC-DC coating for chrome-nickel steels with all types of AC or DC welding equipment. Twenty-three regular analyses, plus several special analyses. *Write for Bulletin 5751.*

BRONZE-ARC phosphor bronze electrodes for all-position welding with reverse polarity on DC. Smooth, easy-flowing arc eliminates any erratic arc action. Makes superior low-spatter, dense, porosity-free, high-strength welds on bronze, brass, copper . . . excellent to join dissimilar metals. *Write for Bulletin AR53-1.*

NICKEL-ARC, NICKEL-ARC 60 electrodes for cast iron. Nickel-Arc 60 is the finest electrode available today for cast iron welding. Like the well-known Nickel-Arc, it has a smooth arc and spatter-free action with AC or DC. Soft machinable deposit is ideal for repairing broken or worn castings. *Write for Bulletin 2218.*



TOOL-ARC electrodes for tools and dies weld each of the five basic types of tool and die steels including: oil hardening, hot work, water hardening, high speed, and air hardening . . . also for work hardening applications. Conserves material, saves man hours, and minimizes production delays. *Write for Bulletin AR52-1.*

WEAR-ARC hard-facing electrodes for fast, economical, efficient rebuilding and hard-facing to resist abrasion, impact, compression, corrosion, and heat. Nine basic types for correcting specific wear patterns, reclaiming worn equipment and parts, guarding against future wear. *Write for Bulletin 5651.*

WELD-ARC low hydrogen electrodes for welding high carbon, high sulphur, free machining, and other difficult-to-weld steels, with AC or DC. Low spatter loss, high deposition efficiency, very quiet arc action, free from tendency to undercut, welds free from under-bead cracking. *Write for Bulletin AR51-1.*

AR-11

Packaged in the familiar Alloy Rods red and yellow all metal moisture proof containers, every rod reaches you in "oven fresh" condition

LOOK FOR THE FLAMING ARC TRADEMARK

ALLOY RODS COMPANY
YORK, PENNSYLVANIA

NO FINER ELECTRODES MADE . . . ANYWHERE

Plastic Welding Helmet

254 ONE-PIECE compression molded construction features the No. 700 Series welding helmet. It is made of thermosetting Fibreglas reinforced with polyester resin. Advantages claimed for the new construction are heat and moisture resistance as well as higher strength.

Fitted in the 700 Series helmet is AO's new No. 3 headgear, made from a plastic that does not absorb moisture. The material conforms easily to any shape head and can be cleaned in antiseptic solution or soap and water. It has a free-floating joint suspension as an integral part with a ratchet-type headgear adjustment. Also standard equipment is a new "S"-type four-position adjustable helmet stop with a steel spring engaging a pin.

Four completely insulated glass holders, light in weight, but with exceptional impact resistance, are available. No. 1130 plastic stationary, No. 1136 plastic lift-front, No. 1085 insulated steel or No. 1096 insulated Dow metal lift-front. Four separate helmets are available in this new series with varying combinations of glass holders, filters and cover plates.

AMERICAN OPTICAL CO., Southbridge, Mass.

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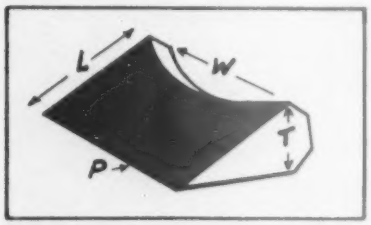
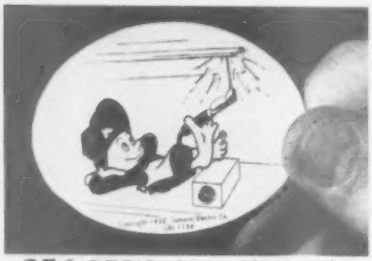


Tooth Repointer

255 NEW "Castaloy Repointers" for repointing manganese steel, alloy steel and steel digger and bucket teeth are made of a special magnetic alloy steel which facilitates welding. Rockwell hardness of the repointer is claimed to be 44 C. A crescent-shaped weld is used to join them to worn teeth—this design tending to cut down on stress concentrations, the major cause of breakage of rebuilt teeth. The Castaloy teeth—come in thicknesses (T in drawing) ranging from ¾ to 2-in. to any desired; widths ranging from 3 to 8 in.; lengths from 1¾-in. to any desired. Points vary from 3/16 up to ¾, the latter sizes being on special order. Contours are 15 deg and bevels 30 deg on all.

INDUSTRIAL OVERLAY METALS INC., Eaton, O.

* * *



256 DECAL for weldors' helmets depicts "Joe Magee" famous General Electric Co. cartoon character in wartime training films. Available free of charge, the decals are two-color, measure 1½ by 2½ in. and can as well as General Electric Co., be obtained from G-E distributors Schenectady 5, N. Y.

* * *

Simple Vapor-Degreaser

257 A NEW low-priced vapor-degreaser, the Wallace DG-1, is ready to go after a 20-minute warm-up. It uses either a 110 or 220 volt heating element and requires only 2½-gal of solvent.

The caster-mounted base and plug-in feature permit portable operations all around the plant for increased efficiency and lower investment cost. A thermostatic control maintains a constant vapor level and prevents overheating. The design provides for quick attachment of a flusher pump, lip-vent, 21-in. diameter work-baskets and other accessories.

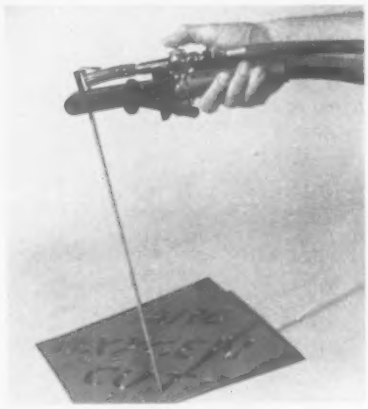
J. D. WALLACE & CO., Chicago 12.

German Bench Welder

258 A new German bench welder, type TP-2, is said to have high current capacity coupled with accurate controls for doing high quality welding work. Because of its ability to make welds quickly, no surface burns are likely to occur and warping is kept at a minimum. It can be used to weld iron and nonferrous metals in typewriting equipment, cash registers, cameras, jewelry, wire nettings, foils and such heat-sensitive material as tungsten, molybdenum, silver, platinum, copper, etc.

ALLGEMEINE ELEKTRIZITAETS GESELLSCHAFT, Berlin, Germany.

* * *



Arc Oxygen Cutting

259 A NEW cutting torch utilizes an electric arc and oxygen gas to cut, pierce and trim steel, stainless, alloy steel and other hard-to-cut metals. Called the Weldwire Cutting Electrode Holder it is said to be reasonable in price and constructed of standard parts. Maintenance is claimed to be simple.

WELDWIRE CO., INC., Philadelphia 25.

(More new products on page 87)

Tobin Bronze repair of a 38,800 lb. lower base of a 1,000-ton press for stamping rear quarter automotive body panels. Base is 18½ feet long, 8½ feet wide.

Braze-welding sends 19-ton press base back to work in 10 days

"Too tough" for other shops—but skill and ANACONDA Tobin Bronze Welding Rods repair 3 breaks to close tolerance

This press base broke in three pieces. On one end, side members pulled ¾ in. out of line. Since the owner insisted on .020-in. tolerance on all dimensions, the right repair shop was hard to find. That is, until Jack Sinclair, Manager, Super-Arc Welding Co. of Detroit, agreed to do this unusual job.

Thermal stresses can easily warp or crack large castings like these. To avoid this, Sinclair braze-welded with Tobin Bronze* Welding Rods. A braze weld needs less preheating. High stresses don't build up. Also, Sinclair knew from experience that Tobin Bronze would flow freely, "tin" quickly, give strong, sound bonds. Welding with Tobin Bronze proved fast, economical and dependable—and had this huge casting back on the job in ten days.

ANACONDA Welding Rods for many types of repair and production jobs are available from distributors throughout the United States. The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 53156

*Reg. U. S. Pat. Off.

braze or weld with confidence— **ANACONDA® *welding rods***

ANACONDA

NEWS

from page 6

Ryan Puts the Heat on Jet Components

FOUR large, new furnaces were recently installed at Ryan Aeronautical Co., San Diego, Calif., to stress relieve parts for afterburners, rocket motors, aft frames and other jet engine parts. One of the newcomers is two stories high with an elevator bottom and another has a 52-ft long tunnel.

At Ryan, heat treating is employed almost exclusively for relieving the residual, "locked-up" stresses caused by welding and forming processes. This is because most jet engine products must withstand high temperatures and critical loads in service. Close control of stress-relief is necessary because of the exacting dimensions to which such parts are designed.

Largest of the new furnaces at Ryan is a General Electric built model used to stress relieve aft frame sections for jet engines. Two stories high, it contains a big brick-lined heating compartment supported on steel columns 9 ft above the factory floor. An ingenious loading car, containing 10 jet engine aft frames, rolls under the furnace and is hoisted by electric motors to form the furnace bottom. By loading vertically, through the bottom, heat losses are reduced to a minimum.

Most unusual model of furnace at Ryan is a Lindberg continuous type machine. It performs heating and cooling simultaneously in separate compartments. Parts are fed into it by means of an endless chain-conveyor belt. It can operate at 2,100 F and can be used for furnace brazing.

Ryan afterburners posed a special problem in heat treating because they are substantially larger than other jet engine components. This was resolved by Industrial Systems, Inc., Los Angeles, who designed and built a large gas-fired furnace that filled the bill.

To accommodate the tall afterburners, the heating compartment was designed as a large brick-lined structure without a bottom and with a front door entry. In a concrete pit, directly in front of the furnace, two mobile loading cars can be loaded from adjacent floor-level platforms. By means of a hydraulic piston, these cars are switched from the loading platforms to the center tracks which lead into the furnace. When loaded with three afterburners, one car is rolled under the furnace bringing them into the heating compartment.

A new Knapp furnace at Ryan is gas-fired, electrically-controlled and is used both for heat treating exhaust systems and jet engine components. Ryan plant engineers have built quick loading mechanisms for this and other Knapp furnaces that have resulted in greater safety for operators, and faster operations.

Arrival of these four furnaces at Ryan shows the continued efforts of the aviation industry to refine its techniques in producing power plants and structures for jet-engined aircraft.

* * *

German Welding Torches Sold by American Messer

WELDING equipment of German design is now available from a new firm, the American Messer Corp., recently organized as the affiliate and sole American representative of Adolf Messer, G.m.b. H., Frankfurt, Germany. Messer welding equipment was widely known in this country before World War II—some 130 Messer oxygen plants are operating throughout the nation.

The full line of Messer equipment includes gas and electric arc welding equipment, automatic flame-cutting machines, oxygen plants and acetylene generators. A recent Messer development of immediate importance to American industry is a process for producing argon gas from air.

The Messer subsidiary is the first to take advantage of recent legislation passed by the Bonn government permitting German companies to establish affiliates in this country. Its New York address is 405 Lexington Ave., New York City 17.

"I DON'T CARE IF IT IS GOOD PUBLICITY. GET YOUR WELDING TORCH OFF THERE!"

* * *

Welding Panel Featured at ASTE Meeting, March 17-20

A BROADLY-RELATED technical program will mark the 21st annual meeting of the American Society of Tool Engineers at Detroit's Hotel Statler, March 17-20. Among the new fields touched will be product design, metallurgy and cost control, according to L. B. Bellamy, ASTE president.

A welding panel will be one of three seven-member panel discussions in connection with the three-day meeting. The welding panel will consider problems in production welding at 3 p.m. Wednesday. Members include R. H. Bennewitz, assistant district manager, Linde Air Products Co.; A. F. Boucher, district manager, The Lincoln Electric Co.; Charles Bruno, chief welding engineer, products and applications department, Reynolds Metals Co.; F. E. Kessler, Welding Equipment & Supply Co.; J. F. Randall, supervisor, welding development section, manufacturing engineering office, Ford Motor Co., and E. J. Zulinski, chief electrical engineer, Progressive Welder Co.

* * *

Western Welding Suppliers Meet Feb. 5-6 in Frisco

THE Mark Hopkins Hotel in San Francisco will be the scene Feb. 5-6 of the western zone meeting of the National Welding Supply Association. The meeting was originally scheduled for the St. Francis Hotel.

the Only New

DEVELOPMENT IN D. C. WELDING IN THE PAST

25 years

The complete story on the **MILLER SELENIUM RECTIFIER TYPE D. C. WELDERS** will prove that they are the only new development in D. C. welding in the past 25 years. We will gladly send you the complete story upon request, and why you can't dispute these facts:

★ . . . that the magnetic amplifier principle built into the **MILLER SELENIUM RECTIFIER TYPE D. C. WELDER** provides high current densities on the electrodes, thus causing rapid vaporization of the weld metal. This permits instantaneous voltage recovery, eliminating momentary short circuits, commonly caused by globules of metal transferred from electrodes to work.

★ . . . that vertical and overhead welding can be accomplished with greater ease by using a **MILLER SR WELDER.**

★ . . . that the **MILLER SR WELDER** will lay down a higher quality of weld metal than any other D. C. welder known today.

5
MODELS TO MEET YOUR SPECIFICATIONS

miller ELECTRIC MANUFACTURING CO.

Since 1929 — *Appleton, Wisconsin*

THE "DIAMOND" TEST . . . is a vital source of information about hard-to-weld metals. Here the operator measures the impression made by forcing a diamond point into a specimen . . . to determine the effect of a weld on the basic structure of the metal. Part of Airco's continuing research and development program — the micro-hardness test is another measure of the unseen "performance insurance" you buy with every Air Reduction product and process!
AT THE FRONTIERS OF PROGRESS YOU'LL FIND...
AIRCO

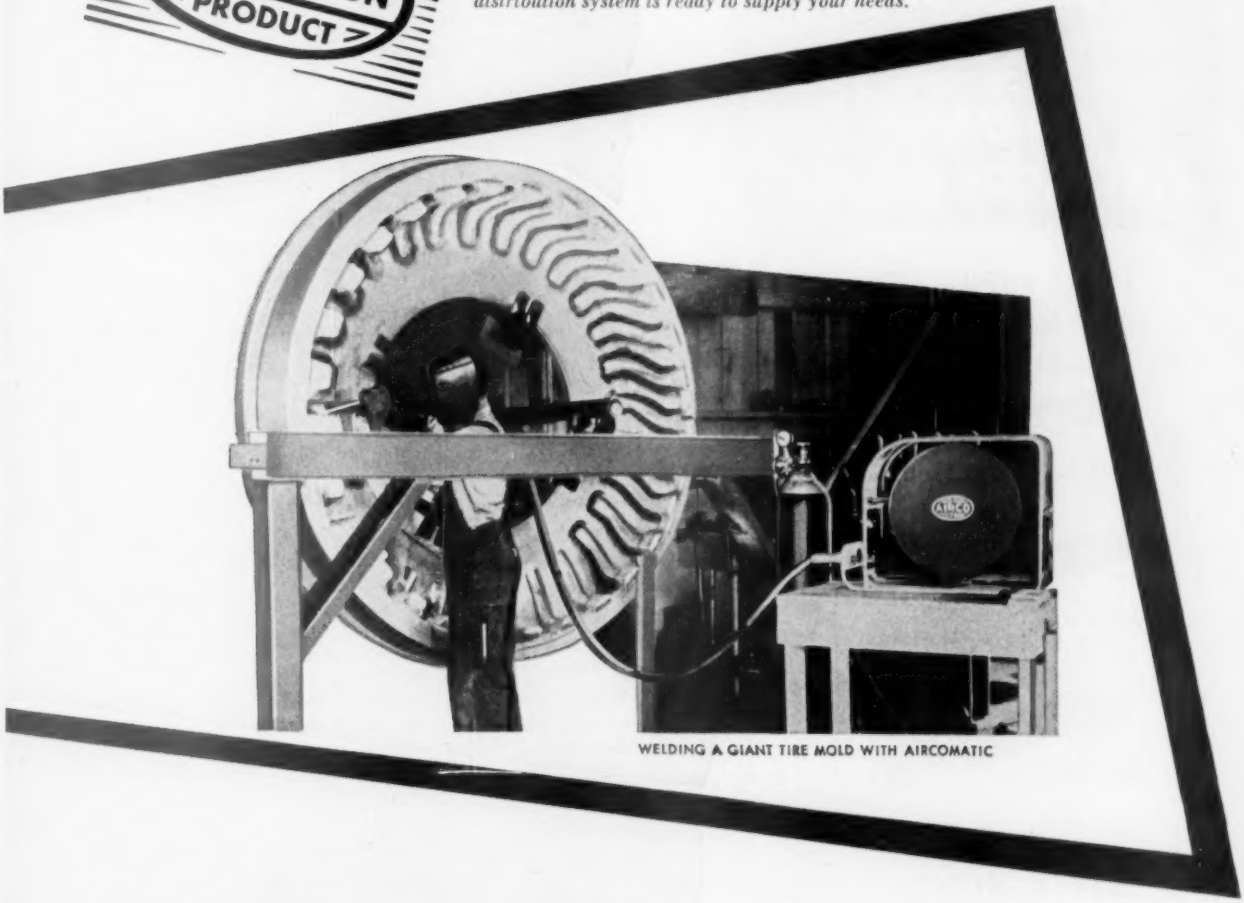
OXYGEN • ACETYLENE • INDUSTRIAL AND RARE GASES • CALCIUM CARBIDE • WELDING SUPPLIES AND ACCESSORIES

"welding" a perfect tread...

AIRCOMATIC® inert gas welding once again demonstrates its ability to handle problem metals in this unique application. A prominent manufacturer of aluminum molds for recapping tires ran into "tread trouble" when attempting to cast tread lugs into the doughnut-shaped tire matrix. Clearance between lug and matrix left an unsightly rubber "fin" on the finished product. The Aircomatic process eliminated this problem with clean, non-porous welds . . . at the same time speeding production through its high-rate deposition of filler metal. No flux was necessary . . . no slag removal . . . minimum "clean-up" on the finished matrix.

... AN AIR REDUCTION PRODUCT

And remember, when you need oxygen, acetylene, other industrial or rare gases, think of Air Reduction. A nation-wide distribution system is ready to supply your needs.



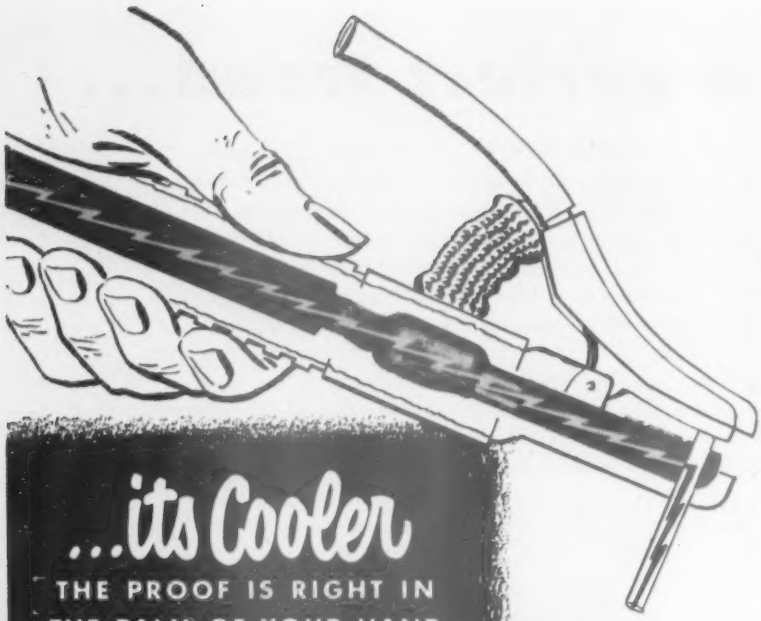
WELDING A GIANT TIRE MOLD WITH AIRCOMATIC

AIR REDUCTION

DEALERS AND OFFICES IN MANY PRINCIPAL CITIES

60 East 42nd Street • New York 17, N. Y.
Air Reduction Sales Co. • Air Reduction Magnolia Co. • Air Reduction Pacific Co.
Represented Internationally by Airco Company International
Divisions of Air Reduction Company, Incorporated

• OXYACETYLENE WELDING AND CUTTING APPARATUS • ARC WELDING AND INERT-GAS ARC WELDING EQUIPMENT



...its Cooler

THE PROOF IS RIGHT IN THE PALM OF YOUR HAND

CADDY®

ELECTRODE HOLDER

FULLY INSULATED MODELS

500 AMP

400 AMP

300 AMP

OTHER MODELS ON REQUEST

FEATURES:

- CADWELD connection—cable to jaw is a 100% conductivity solid copper connection. It is permanent—cannot melt out, burn out, loosen or corrode.
- Short completely replaceable beryllium copper jaw has 80% conductivity.
- Lightweight durable steel body carries no current.
- Cable gripper prevents broken strands and flexing at the connection.
- Operator's hand is over fully insulated cable, air space and handle ribs.
- Fiberglass spring cover withstands 1200° F. heat radiation from the arc.
- NO Shocks—Handle screws eliminated.
- Replaceable fiberglass insulators.

"CADDY" ARC WELDING ACCESSORY DIVISION

ERICO PRODUCTS, INC. • 2070 E. 61st PLACE • CLEVELAND 3, OHIO

Airco Doubles Output at Kentucky Carbide Plant

AIR Reduction Co. announced it is doubling the capacity of its new Calvert City, Ky., calcium carbide plant. This is necessary because of increasing demands from the chemical industry for acetylene generated from calcium carbide.

Originally the Calvert City plant was supposed to have a rated capacity of 142,500 tons per year. Before its completion (expected in 1953) demands created by the DuPont Company's Neoprene plant at Louisville and other industries called for a revision. Output at Calvert City will supplement production at Airco's plant at Louisville.

Availability of plant sites near the Calvert City plant is assured for chemical manufacturers who wish to receive acetylene via pipe line. Airco has purchased approximately 1,500 acres of land for that purpose. B. F. Goodrich Chemical Co., a division of B. F. Goodrich Co., has already located a plant there to make vinyl chloride monomer.

* * *

Ad Series Honors Welding Distributor

ROBERT S. Mars, president of W. P. & R. S. Mars Co., Duluth, Minn., has been chosen for the "Men of Minnesota" series of ads now being run by St. Paul Foundry & Mfg. Co. One of 100 outstanding Minnesota industrialists and citizens to be honored in the ads, Bob Mars formed his present company in 1924. He founded the Ambassadors of Duluth in 1939 and was its first president. He was chairman of the local Civilian Defense Council in the war, president of the Chamber of Commerce and the Community Chest. From 1945 to 1949, he was a member of the board of the directors of the U. S. Chamber of Commerce. In 1950 he was president of the National Welding Supply Association and is still a director. He is a director of the First & American National Bank of Duluth.

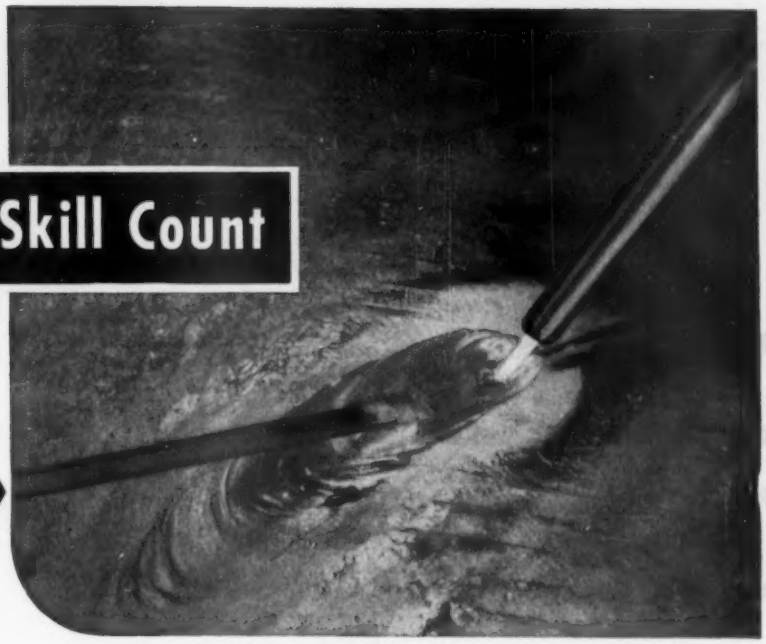
* * *

G-E Builds Service Shop At Philadelphia

A NEW repair and service shop is being constructed by General Electric Co. in Philadelphia. The new plant, designed by G.E. engineers and the Kuljian Corp., will house welding, brazing and machine shop facilities for major repairs. The plant will also be a warehouse for a variety of products such as controllers, motors, instruments and other apparatus.

Make Welding Skill Count

Use OXWELD Trade-Mark Welding Rods →



This unretouched picture shows the clean puddle formed by OXWELD *No. 1 H. T. steel rod . . . free of dirt, seams, and inclusions.*

Even the best operators must use good welding rods to make good welds. To make skill and experience count, a good welding rod is essential.

OXWELD rods insure clean, strong welds. They're developed by welding engineers who supervise every step in their manufacture. Careful testing insures that every rod measures up to OXWELD standards before it leaves the factory. And only rods that pass these rigid tests are marked with the OXWELD label.

There are OXWELD rods for steel, cast iron, wrought iron, copper, bronze, aluminum, and most alloys. Use them on your next job and notice the difference.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 E. 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

All OXWELD Welding Rods
Must Pass These Rigid Tests

Chemical Analysis Test—OXWELD rods must contain specified elements in the exact amounts called for in metallurgical formulas.

Cleanliness Test—OXWELD rods must be chemically clean and free from impurities.

Flame Test—OXWELD rods must flow easily and be free of dirt, seams, and inclusions.

Welding Test—OXWELD rods must unite readily with the base metal . . . good penetration must be obtained easily.

Physical Test—OXWELD rods must measure up to the minimum requirements of tensile strength, ductility, and fatigue resistance.

Oxweld Trade-Mark

WELDING RODS and SUPPLIES

The term "Oxweld" is a registered trade-mark of Union Carbide and Carbon Corporation.

Fingertip heat control

right at the work-with the P&H Welding Twins

equipped with Dial-lectric Control

Dial-lectric Control is an exclusive P&H feature that helps you weld faster, easier, better — at less cost!

P&H AC WELDER

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Also equipped with hand-or foot-operated Dial-lectric Control, to give the welder fingertip heat control at the work. No hard-working cranks to turn. No moving parts to wear out. Saves on power costs under load — and during idle and no-load periods. Protects the primary input line against unbalanced conditions. Three sizes, 200, 300, and 500 amps., NEMA rated.

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3-Day Welding Institute at Wisconsin U., Feb. 17-19

AN outstanding program on practical welding has been planned for the first Welding Technology Institute at the University of Wisconsin, Madison, Feb. 17-19. Leading welding engineers and company research men from the Midwest comprise the speaking roster to promise one of the best informational welding meetings of the year.

Conducted by the College of Engineering and the University Extension Division, the talks will be supplemented by films, slides and demonstrations in the welding laboratory of the mechanical engineering building.

Registration will begin at 8:30 a. m. Tuesday, Feb. 17 in Room 2016, New Electrical Engineering Building at Johnson St., Madison, Wis.

First on the program will be James W. McNaul, professor, department of mechanical engineering, who will give the welcome. Presiding will be Charles A. Gilpin, associate professor of mechanical engineering. Starting off the talks at about 9:15 will be V. Van Gemmert, Harnischfeger Corp., Milwaukee. He will discuss shop procedure and application in welding fabrication.

G. K. Willecke, welding engineer and research director for the Miller Electric Co., Appleton, Wis., will talk at 10:30 on the comparative merits of the selenium rectifier, a-c transformer and d-c generator welders.

After lunch, Howard E. Adkins, assistant professor in mechanical engineering will preside over the talks. First afternoon speaker will be William J. Farrell, chief application engineer for Sciaky Brothers, Inc., Chicago, on the subject of resistance welding and its practical application to fabrication.

Demonstrations by Harnischfeger Corp. and Sciaky Bros. will take place at about 3 o'clock and last an hour. Dinner is scheduled for 6:30 at Rohde's Steak House and will be $3.50 per plate.

Wednesday morning, Roy A. Lindberg, assistant professor of mechanical engineering, will preside at the talks. Factors in the selection of the correct welding processes will be discussed by John J. Chyle, director of welding research, A. O. Smith Corp., Milwaukee. The hard-facing of metals and distortion control will be the subject of the second talk, given by John S. McKeighan, district engineer and manager for The Lincoln Electric Co., Milwaukee.

After lunch on Wednesday, the inert-gas-shielded metal-arc process will be described by J. A. Huna and D. A. Moerke, of Air Reduction Sales Co. As on the previous day, demonstrations will be given until 4:30 by the Lincoln Electric Co. and Airco.

First speaker on Thursday will be T. W. Eseldroth, regional service engineer for Linde Air Products Co., who will talk on modern welding methods including submerged arc and inert-gas-shielded metal-arc. Second speaker will be Robert J. Keller, assistant director of welding research, A. O. Smith Corp., on the subject of developing electrodes for special welding applications.

Demonstrations Thursday afternoon will begin at 1:30 and will be handled by Linde Air Products Co. and A. O. Smith Corp. Last speaker of the meeting will be Austin Hiller of General Electric Co.'s welding department, Chicago. His subject will be welding metallurgy and its effect on design.

Certificates will be presented at 3:30 by Ben G. Elliott, chairman of the department of mechanical engineering.

* * *

Welding Hints Given on 36% Nickel-Iron

SUGGESTIONS for welding 36% nickel-iron alloys of the Invar type have been made available by The International Nickel Co. Welding on Invar up to the present has principally been gas welding with a filler rod of the same alloy. The flame is maintained slightly on the reducing side.

Though sound joints have been made quite easily, considerable warping has resulted. To minimize this, one producer recommends a preheat to 800 F, maintenance of this heat during welding and slow cooling in a furnace preheated to about 1,000 F.

Arc welding of Invar has been successful with commercially-available nickel electrodes (though none of the 36% nickel are believed to be made). Coatings on these electrodes were similar to those on chrome-nickel stainless steels. No difficulty was noticed with the exception of the distortion. A high preheat is therefore a good idea.

If the thermal expansion characteristics of the weld metal are not important, Invar can be welded with a variety of electrodes, including nickel or Inconel, says *Nickel Topics*, International Nickel's company publication. If inert-gas metal-arc welding is to be used, Invar wire is suggested.

Brazing and silver soldering of Invar have been commonly performed. When silver soldering is done manually, the parts should be preheated to 800 F and slowly cooled.

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Carbon Solubility Studied in 18-8 Stainless

INVESTIGATORS at the National Bureau of Standards recently completed important work on the limit of solubility of carbon in types 302 and 304 stainless steels, frequently called 18-8 steels. Sponsored by the Navy Bureau of Aeronautics, the study was conducted by Samuel J. Rosenberg and Carolyn R. Irish of the NBS metallurgical laboratories.

It was found that with a carbon content of 0.007, the lowest content studied, solution was substantially complete between 1,300 and 1,400 F. Solubility appeared to increase about linearly from about 1,400 to 1,975 F, the maximum temperature studied, where carbon solubility was about 0.08%. These values of solubility are appreciably lower than those previously reported.

The solubility curve developed at NBS indicates that type 304 ELC (extra low carbon) stainless steel can be effectively annealed at 1,700 F, but that ordinary type 304 stainless should be annealed at temperatures in excess of 1,900 F if the carbon is to be fully dissolved. The NBS study also points up limitations on the effectiveness of attempts to eliminate intergranular embrittlement of austenitic 18% chromium-10% nickel steel by reducing carbon content.

The specimens investigated at NBS were high-purity iron-nickel-chromium alloys containing various additions of carbon ranging from 0.007 to 0.30%. All alloys were melted and solidified in vacuum. Ingots thus formed (weighing about 2 lb each) were hot-forged to about 0.6-in. diameter, annealed at 1,975 F and cleaned by grinding to about 0.5-in. diameter. Half of each rod was then cold drawn. All of the resulting specimens, both as annealed and as cold drawn, were next held at 800 F for 6 weeks to precipitate carbon in excess of the solubility at that temperature. Finally, samples were held at various higher temperatures to effect re-solution of the precipitated carbides up to the limit of solid solubility.

Several methods for determining the limit of carbon solubility were tried, but only metallographic examination proved feasible. This was complicated, however, by the presence of ferrite and sigma in many of the samples. It was noted that sigma was a stable phase in the lower-carbon alloys, particularly in the temperature range of about 1,000 F to 1,300 F.

The use of type 304 ELC steels in industry is based on the premise that the low carbon content (0.03 max)

will give some protection against intergranular embrittlement. Such embrittlement results when austenitic stainless steels are subjected to temperatures in the range of about 800 to 1,400 F and are either simultaneously or subsequently exposed to the action of certain corrodents.

Although these extra-low-carbon steels have been shown to be less susceptible to intergranular embrittlement than the higher carbon varieties, the NBS studies indicate that it is impracticable to produce steels with carbon contents sufficiently low to insure freedom from carbide precipitation under all conditions of service.

* * *

Biggest Cobalt-60 Source Located at Stanford

THE largest radioactive source outside of AEC installations was unloaded recently at Stanford Research Institute, Palo Alto, Calif. Rated at 4,500 curies, the source took its transcontinental trip from Brookhaven National Laboratory on Long Island in a two-ton lead container with walls eight inches thick. The source consists of four cylinders and a rod, each a foot long. They can be nested or used in various combinations.

The Cobalt-60 will become the heart of the institute's new radiation engineering laboratory. Weighing 10 lb when combined, the five cylinders and rods are separately rated at 1,480, 1,200, 1,100 680 and 110 curies.

Emissions from a source of this size are so powerful that they could be partly duplicated only by $80,000,000 worth of radium. The new source will be used to investigate industrial applications for nuclear energy.

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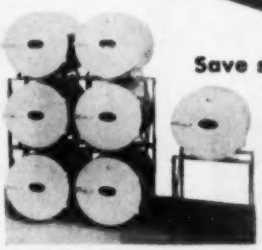
Too many reject welds?

Type 300 Oven

Automatic thermostatic control, 175 to 550° . . . holds 350 lbs. of rods (18" size) . . . safe, adequate 840 watt heater . . . completely wired for 110/220 or 220/440 volt AC . . . sturdy welded-reinforced sheet metal construction . . . insulated — low heat loss, low upkeep.

Engineers say most defects in high-strength welds — X-ray porosity, rough welds, under-bead cracking, etc. — are caused by moist electrodes. DryRod — the original shop-tested *circular* electrode oven — safely preserves the manufacturer's "baked-in" quality . . . keeps rods within the .2% moisture limit allowed. Protect yourself against costly rejects, reworks, scrap loss . . . preserve electrodes conveniently, at low cost, with DryRod. Write for free bulletin.



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Rotate Tip in any direction *even while flame is burning!*

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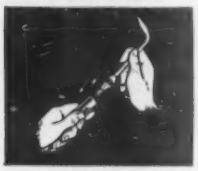

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GUARANTEED service for the rest of your life on all Smith's "LIFELONG" welding torch bodies and cutting assemblies.

THINK what this means in speeding up production schedules and reducing operator fatigue! The average welder is on a stop-and-go basis most of the day — shifting to new positions or stopping to adjust his work — and thus losing production time.

This new Smith Equipment makes it possible to work in the most comfortable and convenient position because the tip can be turned in any direction even while flame is burning. No time out to shut off flame, adjust tip angle or move your work. Just a twist of the finger, or a tap on the side of the tip does the job. It's a time-saver to help you increase production per man-hour and meet production schedules.

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General Electric Handles Electrode Ovens

THE Welding Department of the General Electric Co. is now a national distributor of "DryRod" electrode ovens. They will be stocked by G-E distributors throughout the country in two sizes, a 350-lb and 900-lb capacity. These ovens are used to prevent the damaging effects of moisture pick-up in low-hydrogen electrode coatings.

* * *

Carolina Distributor Boosts Acetylene Capacity

NATIONAL Welders Supply Co., Charlotte, N. C., has just completed the installation of a new acetylene generator that raises the plant capacity to more than 1,500,000 cu ft per month. The generator is part of an expansion program under way for several years.

Organized in 1939 by James A. Turner, Jr., as a distributor of welding supplies and accessories, National Welders built its first acetylene plant in 1944 and its first oxygen plant four years later. The company's oxygen capacity was doubled in 1950, giving a monthly production of over 2,500,000 cu ft of oxygen.

In 1951, the firm moved in a new building having 7,000 sq ft of general office and warehouse space. Completion of the expansion program makes National Welders the largest independent producer of industrial and hospital gases in the Carolinas, it is said.

* * *

Newark Distributor Moves to Larger Quarters

THE Welding Sales Corp., formerly of Newark, N. J., has moved into new and larger quarters in Kenilworth, N. J., according to H. L. Pierce company president. A General Electric distributor, the firm is expanding its staff and services for all types of welding equipment, supplies, accessories and renewal parts.

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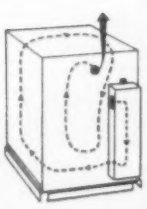

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FREE Literature on latest methods for speedy and economical repair of worn equipment.

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Lincoln Gives $5,131,000 Incentive Pay to Workers

BONUS payments to workers for the Lincoln Electric Co., Cleveland, averaged $4,250 at Christmas in 1952. The record total payment was $5,131,810.

The 19th annual year-end incentive pay bonus was the largest total amount ever paid in the company's history, said James F. Lincoln, president. Every Lincoln worker, except Mr. Lincoln, received an incentive check, a total of 1,208 being necessary.

Besides the incentive bonus payments, $498,000 was set aside for purchase or retirement annuities. The record-breaking bonus came after a big year for the company.

The spring of 1952 saw the company move into its new $10,000,000 plant at 22801 St. Clair Ave. By midsummer it was said to be turning out 50% more production with only 20% more work.

An outstanding victory was won by Lincoln in a 10-year legal battle with the government regarding taxability of the bonus payments. A 15-judge U. S. Tax Court upheld the plan, first challenged by the Bureau of Internal Revenue in 1941.

* * *

Two-Day School Offers Cobalt-60 Handling Hints

AN intensive, two-day training course in the basic knowledge needed to utilize Cobalt-60 sources in industrial radiography is now being offered by Tracerlab, Inc., 130 High St., Boston, Mass. The course of study covers such topics as radiological safety, handling of sources, techniques of exposure, the use of films and screens, use of radiation survey meters, actual practice in exposing, developing and evaluation of film and other pertinent aspects of industrial radiography. The same program will be offered at the company's west coast location, 2295 San Pablo Ave., Berkeley, Calif.

* * *

Aronson Positioners To Sell Under English License

ARONSON Machine Co., Arcade, N. Y., manufacturers of welding positioners, has concluded an agreement with Donald Ross & Partners Ltd., 1-3 Arlington Rd., London N.W.1, England, for the manufacture and sale of Aronson equipment abroad. Positioners covered under the agreement will be marked with the trade name "Twinner-Aronson." Territories India, Australia and South America. served the Ross organization include the British isles, western Europe,

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FIRST in DESIGN — Original design features created by Banner make it first and foremost in the welding field.

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★ Banner Welders can continuously and accurately weld up to 225 spots a minute.

★ Time tested proof of a Banner development is the original design of ram and cylinder and the long bearing surface of 7".

★ Up to 7" adjustment on lower knee. (Unit is available up to 30" throat.)

★ Heavily ribbed cast iron head, with integrally cast cylinder provides utmost rigidity. Manganese Bronze piston specially equipped with 3 cast iron double seal (automotive type) rings reduces friction up to 50%, thus permitting necessary follow-up after welding cycle.

★ Heavy duty selector with contacting pads of ample cross section provides 8 stages of heat regulation.

★ Secondary and secondary pads are water-cooled assuring dissipation of heat in high speed operation.

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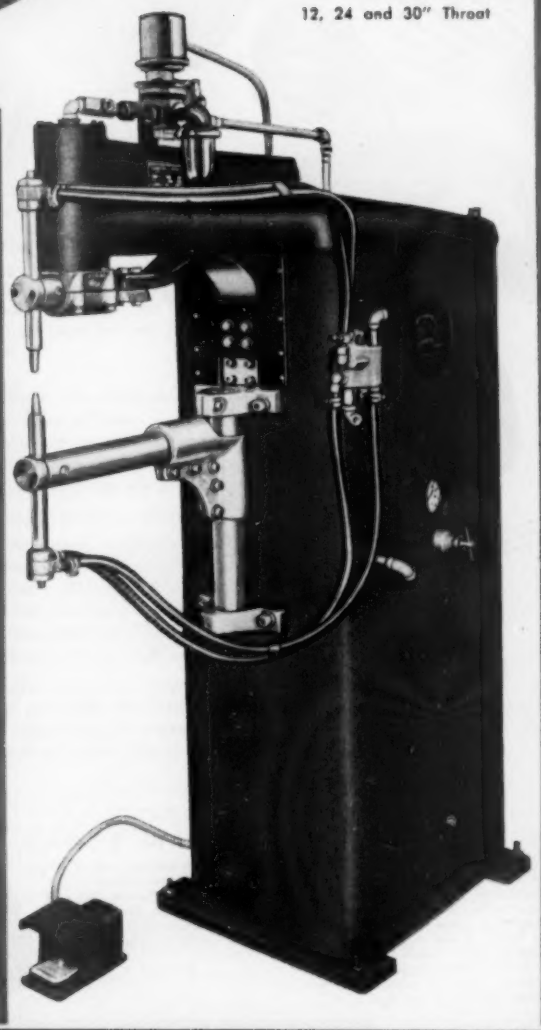

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GB No. 35 Silver Solder, melting range 1130-1270°F
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$2,000 Eutectic Contest Announced for 1953

NEW rules have been announced for the $2,000 contest sponsored by Eutectic Welding Alloys Corp. for non-fusion welding, brazing and soldering papers. The contest is open to engineers, metallurgists, research men, weldors, students, and other interested people in the welding field.

Additional emphasis has been placed in the 1953 rules to recognize papers having more technical background. Cash awards have been revised to provide greater reward for papers in this category.

A special category has been established with $550 in cash awards for practical welding applications. A complete set of contest rules together with a special booklet of hints and a bibliography can be obtained from Eutectic Welding Alloys Corp., Dept. P, 172nd St. and Northern Blvd., Flushing 58, New York City.

* * *

Rail-Mounted Portal Carries Two Automatic Welders

A NEW British-built submerged-arc welding fixture comprises a portal-type, rail-mounted frame from which two welding heads extend downward. The fixture is used to weld flanges to the webs of heavy plate girders of H- or box section up to 100 ft long. It was built by Fusarc for Alexander Findlay and Co., according to the *Times Review of Industry*.

The heavy portal frame is motor-powered and can be moved into position at speeds up to 16 fpm. It travels for welding at speeds infinitely variable between 7 and 28 ipm. The two Fusarc welding heads with all controls are supported on a cross traverse runway with adjustable counter-balanced boom, and can be arranged to allow a vertical operating height of between 1 and 11 ft.

—McGraw-Hill World News

* * *

Alloy Rods Co. Adds Seven Electrode Distributors

SEVEN new distributors for the complete line of Alloy Rods Co.'s alloy arc welding electrodes have been announced by E. R. Walsh, III, general sales manager. They are: Altoona Auto Accessories Co., Altoona, Pa.; Mississippi Supply Co., Chicago, Ill.; Central Welding Equipment Co., Fort Smith, Ark.; Bailey Welding Supply Co., Houston, Tex.; Randall-Graw Company, Inc., La Crosse, Wis.; R. & G. Auto Supply Co., Valley City, N. Dak. and Worland Oxygen Co., Worland, Wyo.

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Yes, it's

AO HEAVY DUTY HORSEHIDE

Best for Flexibility, Heat Resistance, Wear

"Shake hands" with AO's "super" line of hand protection for welders. Each glove and mitten is 14" long . . . has a smooth finish . . . improved heavy weight soft lining on back for greater protection . . . quality edges bound with tape and stitched. These are features which make this chrome-tanned *horsehide* line better than ever. Test them on the job. *See* the difference! *Feel* the difference! Your nearest AO Safety Products Representative can supply you.

TX100 Gunn cut—one piece back. Double thickness of leather on first finger and thumb, also on portion of palm. Lined on back from wrist to finger-tips.

5X163 Gives exceptional resistance to heat on gas welding and heaviest amperage electric welding. One-piece back and palm. Welted at all vulnerable seams. Extra heavy lining on back of hand.

TX200 Gunn style. Standard size (11) also sizes 10, 12. Welted seam at base of palm and wrist. One-piece back. Wing thumb.

6X141 One-piece back and palm. Crotch of thumb reinforced with wide leather strap. All vulnerable seams welted for extra protection. Back of hand is lined.

Also ask to see and feel the other six gloves and mittens in this top quality AO line.

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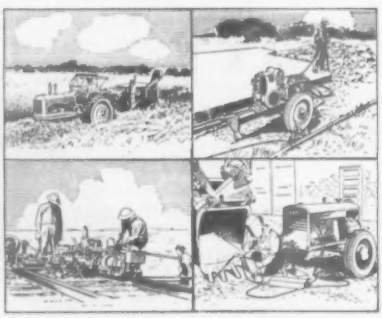

WISCONSIN *Air-Cooled* ENGINES

Fit the Job and the Machine

Because Wisconsin Air-Cooled Engines are supplied in a complete power range, from 3 to 30 H.P., in 4-cycle single cylinder, 2- and 4-cylinder types, there is an ideal size to fit all types of machines and power applications within this range, without wasted power and with maximum power service benefits. Heavy-duty construction, combined with extremely compact design and light weight are added advantages—and dependable AIR-COOLING permits trouble-free service under all climatic conditions.

Single cyl. 3 to 9 H.P.

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MOST H.P. HOURS

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World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

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Widespread Aluminum Use In Postwar Europe

THE use of aluminum is more widely diversified in Europe than in this country, reports Frank R. Nichols, president of Nichols Wire & Aluminum Co., Davenport, Iowa. Mr. Nichols has just returned from an extended trip on the continent and the British Isles.

He visited aluminum industries in seven countries and observed that many of them led America in the use of aluminum for housing, heavy construction, automobiles, electric wiring and canning. Switzerland has developed a new type of roofing, one of a host of new aluminum products. This roofing is a reverse arch type, using a keystone-shaped section between arches as a locking device. It is light, cheap, exceptionally strong, easily installed and fastened only from within the building. The new roofing is quite handsome and acceptable for high quality architecture, said Mr. Nichols.

Some countries are also ahead of the U. S. in certain processes and finishes. Aluminum foil made in Switzerland has a superior finish. The continuous casting program of Illario (Properzi) in Milan, Italy, is years ahead of American experiments.

Prefabricated designs on the continent use aluminum in the structure of walls and roofing of homes, schools and office buildings. In England, a great new 200-ft clear-span hanger for the Comet jet transports is almost entirely aluminum, Nichols said.

* * *

Eutectic Trains 562 Men During 1952

A TOTAL of 562 advanced weldors were trained in the Eutectic Welding Institute's classes in Flushing, N. Y., and its new West Coast school. This type of school is considered unique since it trains only experienced weldors in the newest welding techniques by the clinic or conference method.

With this method, the lecture period is kept short and immediately followed with detailed demonstrations in which the students join. To maintain close instructor-student relationships, the classes are limited in size. Each course takes a full week, with classes held every two weeks throughout the entire year. First class this year was Jan. 12. For more information, write to Eutectic Welding Alloys Corp., Dept. P, 172n St. at Northern Blvd., Flushing 58, New York City.

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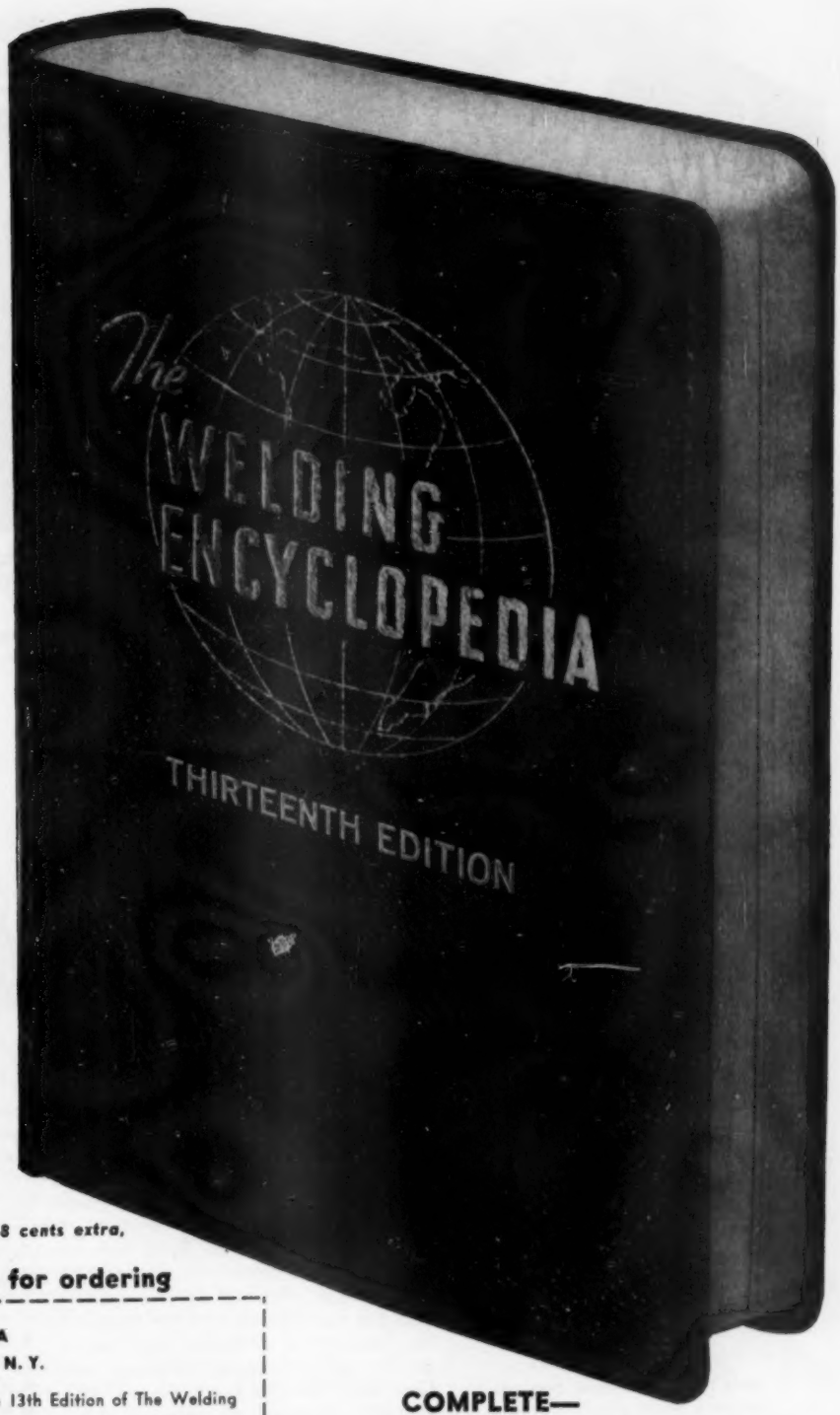

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Weld with
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. . . an all-position phosphor-bronze electrode that's easy to handle.

Phos-Trode is ideally suited for overlay work and for general maintenance and repair welding throughout industry.

In addition you get these 4 important advantages that keep welding costs down.

1. **All position** — Deposit solidifies rapidly — can be used for flat, vertical or overhead welding, operates on reverse polarity DC.

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4. **Sound deposits, high physicals** — Special ingredients in Phos-Trode coating give properly deoxidized deposits, sound welds and correct bead contour.

Phos-Trode, the most versatile electrode in the phosphor-bronze field, is available in 6 sizes from 3/32" to 1/4". Order your supply now and take advantage of Phos-Trode's 4-way savings.

W-116

AMPCO

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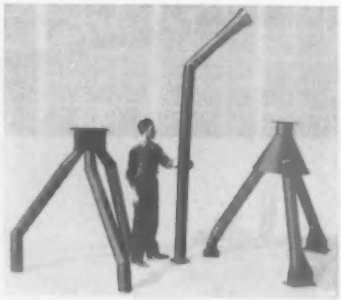
MILWAUKEE 46, WISCONSIN
West Coast Plant: Burbank, California

It's Production-Wise to Ampco-ize!



Welded Plastic Ducts Carry Corrosive Exhaust

ADVANTAGES of new thermoplastic all-welded exhaust manifolds and ducts are said to be corrosion-resistance, light weight, ease of installation and long service life. Construction is fully rigid, says the maker, American Agile Corp., Bedford, O.

Made from polyethylene and unplasticized polyvinyl chloride, the ducts resist a great number of chemical reagents and are fabricated to the customer's specifications in square or round designs. They can be fitted into existing duct systems.

* * *

Aluminum Supply Good by Mid-Year Says Reynolds

BARRING an extension of the Korean war, plenty of aluminum should be available by mid-1953. So predicted Richard S. Reynolds, Jr., president of Reynolds Metals Co. at year's end. Although 1952 production was about 1,900,000,000 lb and 11% greater than 1951, it does not fully reflect plant expansion already completed.

The big surge in actual production, declared Mr. Reynolds, will be in 1953 and 1954 with an output of 2,500,000,000 lb in 1953 and 3,000,000,000 in 1954. Reynolds Metals' 1952 output was estimated at 552,000,000 lb, he said.

* * *

Natural Gas Converted To Acetylene

PRODUCTION of acetylene from natural gas was described to the American Institute of Chemical Engineers at the group's annual meeting in Cleveland. The new process is said to promise increased supplies of this chemical intermediate at lower costs.

Theodore Weaver of Fluor Corp., Los Angeles, said the process included a novel furnace in which the direction of the flow of natural gas is reversed every sixty seconds. Acetylene is obtained at heats of 2,200 F. A vacuum chamber is also used to prevent the acetylene from breaking down.

SPATTER CHATTER

Independent Research Proves Superiority of Cam-Lok Connectors

A world-famous manufacturer of welding equipment recently tested Cam-Lok Cable Connectors against competitive connectors. With a 400 ampere load, the Cam-Lok Connector showed only 10.6 millivolt drop, indicating negligible resistance. In comparison, a solid brass bar, the same size and shape as the Cam-Lok Connector, showed 5.8 millivolt drop, proving that the Cam-Lok Connector *is almost as efficient as a solid piece of brass.*

- **Double-Cam principle assures most perfect contact possible**
- **Solid brass, precision machined**
- **Positive vibration-proof connection**
- **No weaving, no arcing, no heating, no burning**
- **Time, money, trouble-saving interchangeability**

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nine years
steady use

practically
no
maintenance
expense...

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Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.
JDT:mg

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

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SERVING THE METAL INDUSTRY SINCE 1905

You can't pick up the wrong end with

POSITIVE CONNECTION *quicker!*

EITHEREND

FIELD PROVEN BY 10 YEARS TOUGH SERVICE

Wherever connectors are needed for single conductor cable, Anderson EITHERENDS satisfy all requirements.

Made of specially tempered tubing which provides a positive, wiping-action contact. The heavy spring action of EITHEREND contact surfaces assures efficient electrical connections, yet the ends go together and come apart with surprising ease.

NEW COVEREND SLEEVE

Molded Rubber insulating sleeves are available in two types. The standard is shown in the illustration above. When in use these enclose the connection completely. For most applications the standard sleeve is satisfactory; but there are places, especially when working on metal surfaces, where it is desirable to cover the ends when disconnected. For such applications we offer our Coverend sleeve shown on the left. Note the expanding bellows which completely encloses the end when disconnected, and when joined collapses to permit the two connector halves to completely engage each other.

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ALBERT & J. M. ANDERSON MFG. CO.

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USE Silvaloy ALLOYS and FLUX

FOR SILVER BRAZING STAINLESS STEEL

Silvaloy 355 is a low temperature cadmium-free alloy especially adapted for brazing of food handling and dairy equipment, and where a close color match is desired.

Silvaloy 50 and 45 are extremely fluid. Free-flowing at temperatures of 1145° F. to 1295° F. Especially designed for production brazing on stainless steel.

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Coated rods in either A.C. or D.C. Titania coated or Lime D.C. coated.

USES

Use 1200 Flux for silver brazing Brass, Stainless Steel, Bronze, Nickel-Silver, Steel, Monel, Inconel, Nickel and Cast Iron. Furnished in ½ lb., 1 lb., 5 lb., and 30 lb. containers.

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Franklin Balmar Corp. Is New Name

EFFECTIVE Jan. 1, Franklin Balmar Corp. is the new name of The Balmar Corp., Woodberry, Baltimore, Md. It will continue as the manufacturing subsidiary of the Franklin Railway Supply Co. The officers of Franklin Balmar Corp. are the same as those under the previous name, with the addition of J. E. Long, vice-president in charge of product sales and J. J. Kirchhof, vice-president in charge of engineering.

In 1949, Balmar purchased the N. A. Strand Co., Chicago manufacturer of flexible shafts and flexible shaft machines, originally established in 1903. Eastern sales for Strand, operated as a division, are handled by J. L. Strohmer, Baltimore, and western sales by J. O. Edgerton, Chicago.

* * *

Liquid Oxygen Gains Industry Friends

FACILITIES for the manufacture of oxygen have been increased nearly 50% within the last two years. Most of this new output is liquid oxygen, virtually unused before the war.

Reason for the trend is the cheaper cost of handling and transporting oxygen in the liquid state. For example, to ship approximately 20 lb of gaseous oxygen (200 cu ft) a 130 lb steel cylinder must be sent along too. A single cu ft of liquid oxygen contains 860 cu ft, however, so the saving in freight is obvious, despite extra weight needed for insulation. Liquid oxygen need not be shipped under high pressure, so much steel is saved right there. The insulation is necessary because liquid oxygen is about 297 deg below zero.

* * *

Tungsten Supply At High Level

THE International Materials Conference has announced that the free world tungsten production is now high enough to consider ending allocations. Supply and demand are in approximate balance. Production is at a new high with 4,700 tons estimated for the first quarter of 1953 against 3,150 tons produced in the third quarter of 1951.

* * *

New "Chemalloy" Distributor

MERCHANT & EVANS Co., Philadelphia has been appointed exclusive distributor for "Chemalloy" welding alloy in the Philadelphia area. In business since 1866, the Merchant & Evans Co. will service aluminum fabricators and the welding trade.

NEW PRODUCTS

(Continued from page 64)

Lift-Front Holder

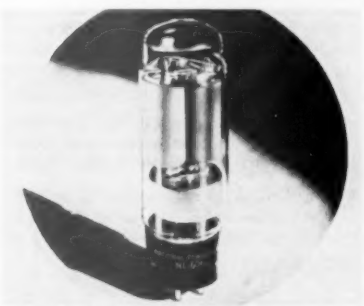
260 NEWEST Sellstrom welding product is a "Lift-Front" welding plate retainer for welding helmets. The new design provides for the inner clear protective plate to be permanently mounted on a stationary frame separate and behind the movable filter plate. When the filter plate is lifted to see clearly, the stationary clear plate remains to guard the eyes against flying slag. The filter plate and clear plate are both held in place by separate tension springs.

A hidden spring in the window hinge keeps it firmly up or down without affecting the clear plate. The frame is moulded from "Durez" plastic and as extra protection has a pressed steel cover front.

Called the "S" "Lift-Front" retainer, it can be furnished with any round-front Sellstrom helmet. It is also interchangeable with the standard front loading plate retainer.

SELLSTROM MFG. CO., Chicago 22.

* * *



Full-Wave Rectifier

261 A NEW high-current full-wave rectifier tube carries 6.4 amp d-c and 25.6 amp peak rating. Designated NL-606, it was designed specially for industrial power rectification requiring higher voltages up to 900 volts peak inverse or 250 volts d-c.

The tube is gas and mercury filled for quick-starting, long life and high peak inverse within wide temperature limits. Other ratings are: filament voltage, 2.5 volts; filament current, 17 amp, peak inverse volts, 900.

NATIONAL ELECTRONICS, INC., Geneva, Ill.

an ACCO product
for Stainless Steel WELDING
AC-DC Electrodes
GAS Welding Rods
made by
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BURNING...
stable even at lower heats
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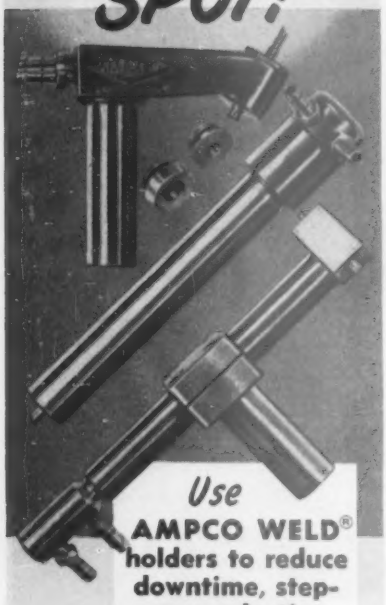
Put resistance welding costs on the SPOT!



Use **AMPCO WELD® holders to reduce downtime, step-up production**

There's an AMPCO WELD® holder for every resistance-welding job — offset ejector holders, straight ejector holders, universal ejector holders. All are leak-proof. Made of high-conductivity Ampco Bronze alloys, they meet or exceed RWMA specifications to give you trouble-free operation, longer runs, reduced downtime, and increased output.

. . . AMPCO* Engineering Service when you need it

Behind the famous AMPCO WELD® line of resistance-welding products is a corps of experienced engineers, ready to help you solve your problems. Just get in touch with us.

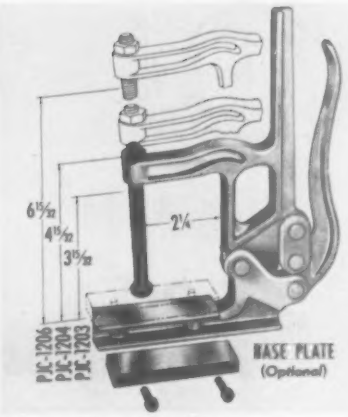
AMPCO METAL, INC.

AMPCO • MILWAUKEE 46 WISCONSIN

West Coast Plant, Burbank, California

It's production-wise to Ampco-ize!

*Reg. U. S. Pat. Off., Ampco Metal, Inc., Milwaukee



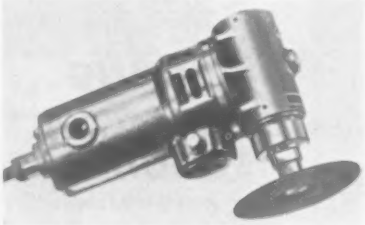
New Toggle-Clamps

262 EIGHT new toggle-clamps are announced by Lapeer. All are of the plier type, five having horizontal handles and three vertical handles (shown above). They have long, thick, flat bases with an extra base plate optional.

Purpose of the new clamps is to provide individual clamps with greater thickness capacity. The PJP series represents a clamping range from 1 11/16 to 6 15/32 in. with throat capacities of 1½ to 2¼ in. The PJC series represents a range from 3 15/32 in. to 6 15/32 in. with throat capacity of 2¼ in. In each type of clamp the base plate is available in either of two ways 1) in soft metal so that the owner can adapt it to his particular needs, furnished with two bolts for attaching, or 2) in hard metal, already installed.

LAPEER MFG. CO., Lapeer, Mich.

* * *



High-Speed Grinder

263 THE "Diskette Model B-2", an improved version high-speed grinder will perform portable grinding, sanding and polishing. Its capacity is a 4-in. disc. All bearings are specially chosen for the higher-than-usual speeds of the tool. A double cooling fan has been added to further increase cooling efficiency. A universal motor for 110-220 volts, a-c or d-c, gives the spindle shaft a no-load speed of about 9,000 rpm. A collet chuck in the spindle takes all attachments.

FRANKLIN BALMAR CORP., Baltimore 11, Md.

Build your own business

Flame-Machining Gears, Sprockets

IF YOU do flame cutting and welding, you can build your own manufacturing business quickly, and without great expense, by installing Cogmatic automatic gear and sprocket machine. Cogmatic method makes it possible for you to . . .

- Make gears and sprockets out of high carbon and alloy plate — automatically deep case-hardened for longer wear.
- Sell to ready market, replacing inferior cast-iron sprockets and gears now used on farm, mill and factory, and construction equipment.
- Flame-machine as much tooth metal per hour as is possible with *three* conventional gear cutting machines.
- Automatically cut over 300 different shapes and sizes of teeth . . . 5 to 200 teeth per wheel.
- Flame-cut 3 at a time up to 15" diameter . . . one at a time, up to 108" diameter.
- Offer product engineers and designers the above wide choices where before they were confined to stock sizes, or paid high prices for "specials."
- Furnish industry in your territory 24-hour service on breakdown sprockets or gears.

All information you need to go right into production is available — tables, speed data, practical know-how from our qualified service engineers.

For details, write your address in margin and mail this ad to . . .

C-3

COGMATIC CO.
1330 NORTH FRANKLIN PLACE
MILWAUKEE • WISCONSIN

Tiny Circuit Breaker

264 A NEW miniature circuit-breaker fits like a fuse in any standard Edison base fuseholder delivering up to 125 volt a-c service. It requires no additional equipment and no special wiring when applied to branch or main circuits of corresponding 15, 20 or 30 amp ratings. When the circuit is broken, electrical service can be restored by pressing in and releasing the shock-proof reset button on the top of the unit.

Called "Mini-breaker", it is said to be the only circuit protective device of its kind to meet all the essential design, safety and performance requirements established by Underwriters' Laboratories, Inc.

MECHANICAL PRODUCTS, INC., Jackson, Mich.

* * *

Phosphor-Bronze Rod

265 AN improved phosphor bronze electrode for arc brazing nickel alloys and cast and malleable iron as well as arc welding copper, bronze and brass is called All-State No. 24 Type C. A reverse polarity d-c electrode, it has a special coating that is said to protect each drop of metal as it leaves the electrode end. Analysis of the deposit is as follows: copper, 91.73%, tin, 7.85%, silicon, 0.07%, phosphorus, 0.05%, iron, 0.20% and others, 0.10%. Physical characteristics: tensile strength, 61,000 psi; yield strength, 34,000 psi; elongation in 2-in, 42.5%, Brinell hardness, 72. It comes in six standard sizes between 3/32-in. and ¼ in.

ALL-STATE WELDING ALLOYS CO., White Plains, N. Y.

* * *

Anti-Fog Liquid

266 A new silicone liquid, "Fog-Free," is said to be effective in preventing fogging and steaming of welding goggles, face shields, prescription glasses, windows and other glass or plastic surfaces. It does not contain alcohol or glycerine. Packed in 4-oz. "squeeze-spray" plastic bottles, it is easy to use. A drop is all that's needed on a goggle lens or a quick spray for larger surfaces.

INDUSTRIAL PRODUCTS CO., Philadelphia 33.

There's muscle easing balance in all four models of Gasweld torches from the zephyr-light Featherweight Torch to the rugged heavy duty Pacemaker.

BALANCE—that makes it easy to handle long jobs—that cuts down fatigue—that steps up output.

That's just one of the features of this outstanding line—get the full facts—write for Catalog No. 5026 covering the full line of the famous "Gasweld" welding and cutting equipment.

Liquid also produces Oxygen, Acetylene and other commercial gases including CO_2 in all its forms—Gas, Liquid or Solid (dry ice) for industrial use.

THE LIQUID CARBONIC CORPORATION
INDUSTRIAL GAS DIVISION
3110 South Kedzie Avenue, Chicago 23, Illinois

Gentlemen:
Please send me your new Catalog No. 5026 of welding and cutting equipment and supplies.

The Liquid Carbonic Corporation, Industrial Gas Division
3110 South Kedzie Avenue, Chicago 23, Illinois

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QUALITY
EYE AND FACE
Safeguards

Selllstrom Welding Helmet with the Sel-O-Matic Head Gear

This No. 243-M Welding Helmet is of one-piece tough fibre construction, has the popular rounded front and is perfectly balanced. Meets all Federal Specifications. Equipped with the Sellstrom Standard Front-Loading plate holder. Takes the regulation 2" x 4¼" plate.

Here are some of the special headgear details:

1. The Sel-O-Matic headgear is exclusive with Sellstrom.
2. Tension springs permit wearer to adjust helmet to remain in any desired position.
3. While the helmet is on the head, it can be adjusted with one hand to fit perfectly.
4. Genuine top grain leather sweat band kept in place by snap fasteners.

Order from your dealer or write us direct. We will gladly ship a sample helmet on memo for inspection purposes.

sellstrom
MANUFACTURING COMPANY

Top Quality Eye and Face Safeguards
626 N. Aberdeen St. Chicago 22, Illinois

Multi-Shade Filter

267 A new "Vari-Shade" welding helmet attachment provides continuous welding filter-protection in shades No. 6 through 12. By rotating the knurled circular ring, the density of shade becomes continuously darker or lighter. This eliminates changing lenses when switching from one type of metal to another. It is further helpful for striking an arc since the helmet can be over the eyes the whole time—it is only necessary to set the shade light to start and flip it to dark once the arc is established. A 1,000-hour cover lens is furnished with each "Vari-Shade" helmet attachment. The attachments are designed to fit all standard welding helmets.

POLACOAT INC., Blue Ash, Ohio.

NEW PRODUCTS BRIEFS

268 **Fast-drying marking ink** makes permanent symbols on castings, sheets and plates that are stored outside or under cover. Ink is said to withstand two years of weather or rough handling. It is applied from a burst-proof tube with a ball point attachment. John P. Nissen, Jr., Co., Glenside, Pa.

* * *

269 **A waterless wash station** now on the market automatically dispenses the right amount of waterless skin cleanser and provides paper towels for wiping off the grime. Base of the "Waterless Washstation" is made of heavy gage steel. Needing no plumbing it can be set up anywhere in the plant. Sugar Beet Products Co., Saginaw, Mich.

* * *

270 **Welding curtains** made from "Duratex" are said to be strong, fire-resistant and shrinkproof. It is mildew- and rot-proof, non-absorbent and easily cleaned. Acids, alkalis, oils and greases are resisted by the special synthetic coating. Duracote Corp., Ravenna, O.

Tempilstik°

the amazing Crayons that tell temperatures

A simple method of controlling working temperatures in:

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
- HEAT-TREATING IN GENERAL

It's this simple. Select the Tempilstik° for the working temperature you want. Mark your workpiece with it. When the Tempilstik° mark melts, the specified temperature has been reached.

$2 each gives up to 2000 readings

Available in these temperatures (°F)

113	263	400	950	1500
125	275	450	1000	1550
138	288	500	1050	1600
150	300	550	1100	1650
163	313	600	1150	1700
175	325	650	1200	1750
188	338	700	1250	1800
200	350	750	1300	1850
213	363	800	1350	1900
225	375	850	1400	1950
238	388	900	1450	2000

Also available in pellet or liquid form.

FREE —Tempil° "Basic Guide to Ferrous Metallurgy" — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

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New York 10, N. Y.

About People

GEORGE B. HOWELL has been named manager of manufacturing for the General Electric Company's welding department at Fitchburg, Mass. He succeeds Mr. Thomas Sproule who is now in the G-E manufacturing services division. Mr. Howell was graduated from Cornell in 1942. He joined the G-E test course in 1946 and was appointed purchasing agent for the G-E lighting and rectifier department in 1950. A year later he was named superintendent of manufacturing for the welding department, the position he held until the present time.

* * *

N. L. ANDRUS has been appointed general sales manager for Smith Welding Equipment Corp., Minneapolis. He will be in charge of all sales and distribution, both domestic and foreign. With Smith about 15 years, he was first sales manager for arc welders and then assistant sales manager on the general line. Recently he has been district sales manager in the East.

* * *

PAUL F. AARON has been appointed plant manager of the Cincinnati Tool Co., Cincinnati, O. He was previously with Crosley Div., Avco Corp.

* * *

E. C. BREKELBAUM, formerly vice-president and executive engineer of Harnischfeger Corp., Milwaukee, has been appointed director of methods of The Thew Shovel Co., Lorain, O. Scope of this new post at Thew includes any operation within the engineering and manufacturing departments. Born in Germany, Mr. Brekelbaum came to this country at 14 years of age. He graduated from Stanford University with an engineering degree and spent two years in Europe as an engineer for an excavator manufacturer. In 1935, he started with Harnischfeger as a welding foreman and was successively welding superintendent, welding engineer, executive chief engineer and vice-president and executive engineer.

Salvage Tons of Castings Daily

Fill in Porosity *and* Blow Holes

with DOT-WELDING

Read What Users Say About DOT-WELDING

"... 8,000 lbs. of castings salvaged per day by Dot-Welding."
Plumbing and Heating Mfr.

"We salvage 75,000 lbs. of grey iron castings from 200 lbs. of welding rod by Dot-Weld Process."
Stove and Castings Mfr.

"We are saving about 75 automobile engine blocks per month as a result of using your equipment."
Engine Rebuilder

"... 10 to 15 tons of castings reclaimed every 24 hours ..."
Farm Tractor Company

No foundry or shop can afford to be without Dot-Weld Equipment. This exclusive cold-weld process assures effective, speedy, low-cost repair of defective castings. Also in wide use for press fit work and engine block and head repair—as well as pattern work where metal can be added to worn core boxes.

Low-temperature Dot-Weld deposited metal eliminates possibility of heat distortion and residual stresses. Deposited metal leaves no hard spots on castings. Proved time and money saver. Get the facts today.

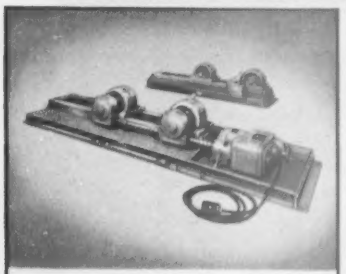
Learn about this all-important method for casting salvage. Write for full information on the Dot-Weld Process and equipment today.

METALLIZING COMPANY
of America
3520 West Carroll Avenue
Chicago 24, Illinois

REED
ENGINEERING CO.

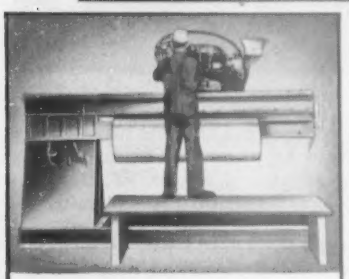
Modern
Metalworking
Equipment

- BENDING ROLLS
- TURNING ROLLS
- AUTOMATIC WELDING FIXTURES



REED PORTABLE TURNING ROLLS

- ★ In 5 models; capacities up to 75 tons
- ★ For hand or automatic welding, finishing operations on tanks up to 14 ft. diam.
- ★ Reversible, variable speed adjustment
- ★ Rugged, all-steel construction
- ★ Built-in silent worm gear drive



HORN TYPE WELDING JIGS

- ★ In 6 models; capacities up to 9 ft. x 3/8 inch
- ★ In 2 styles for light or heavy shells
- ★ Water-cooled copper weld backing bars
- ★ Positive, rigid, toggle-action clamping
- ★ Track for any automatic welding head

WE INVITE YOU . . .
to write us for specifications, prices, list of REED users near you. No obligation. Just write on your letterhead.

REED ENGINEERING CO.
1007 W. FAIRVIEW, CARTHAGE, MISSOURI

HAROLD BURNIP has been appointed director of purchases by The Lincoln Electric Co. Now responsbile for all Lincoln purchasing he has been with the company 10 years and recently as project engineer supervised the building of their new $10,000,000 plant. NORMAN ZOLLAR assumes the responsibilities of purchase engineering, the position formerly held by Mr. Burnip. ARTHUR WALPER will take over from Mr. Zollar as manager of electrode division purchases. WILLIAM TOWARD continues as manager of machine division purchases.

* * *

J. ROY BAREFOOT, JR. has been elected vice-president of the Federal Machine and Welder Co., Warren, O. He was graduated from Penn State College and has worked for Federal since May, 1941. He was named manager of operations in 1949. Very active in the Resistance Welder Manufacturers Association, he is now president of the organization.

* * *

A. F. LEACH has been named manager of renewal parts sales for the General Electric Company's welding department. He will be succeeded in his former position as manager of electrode sales by ARTHUR WARD. Mr. Leach graduated from the University of Texas in 1941 and joined the G-E test course the same year. Mr. Ward served in the Navy for six years during the war and received his chemistry degree from the University of Massachusetts in 1950.

* * *

RICHARD E. BALLENTINE has been named plant manager of the new welding electrode plant being constructed at Montevallo, Ala., by the Westinghouse Electric Corp. Until completion of the plant, expected in September, Mr. Ballentine will continue in his present job as development engineer on brazing alloys for the motor and control division. He has worked for Westinghouse since 1940.

* * *

LOYD L. "MAC" MCCAIN has been moved up from sales vice-president to vice-president and managing director of Wagner Mfg. Co., Jackson, Mo. After seven years in the welding supply business, Mr. McCain joined Wagner in 1950 as general sales manager. He became a vice-president in April, 1951.

"Red Head"
WELDING CLAMPS

- Designed for Welding
- No Threads To Damage

1. Case Hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.
2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.
3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

CHICAGO BOILER COMPANY
1969 CLYBOURN AVENUE
CHICAGO 14, ILLINOIS

For Permanent
Good Results in Welding

METAL BOND
SOLDERING AND WELDING
PRODUCTS

- TINNING COMPOUND—cleans and tins in one operation
- SOLDERING SALTS—takes place of acids—fast cleaner
- HARD METAL—for scored cylinders and cast iron soldering
- ALUMINUM SOLDER—for cast or drawn aluminum and die-cast metal
- MOULDOUGH—for backing up job to weld against
- BRAZING FLUX NO. 10—for brazing all metals
- SPECIAL NO. 31—cast iron brazing flux
- ALUMINUM WELDING FLUX—for cast or drawn aluminum
- SEAL-X-O—for filling pin holes in electric welds
- CAST IRON WELDING FLUX NO. 4—also All Steel Wire Brushes and Rod Holders

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METAL BOND MFG. CO. St. Louis, U.S.A.

Try them yourself—find out why they are so widely used. Our handy-size catalog will give you helpful advice—send for it!

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3201 KOSSUTH AVE.
ST. LOUIS 7, MISSOURI

WILLIAM D. BANKS has been named Canadian sales supervisor for Link Welder Corp., Detroit, Mich. He was previously associated with the Ford Motor Company of Canada as a process engineer. Mr. Banks has established Link Welder Canadian offices at 209 Park Building, 29 Park St. West, Windsor, Ontario.

* * *

GORDON E. LEOPOLD has been promoted to district manager of the Minneapolis office of Harnischfeger Corp. P. H SACKETT, however, continues in his capacity as manager of farm welder sales for the Minneapolis welder territory. Mr. Leopold joined Harnischfeger in 1941 and was called to military service for four years beginning in 1942.

* * *

WALTER R. HILLMAN has been appointed assistant to the vice-president in charge of production at Eutectic Welding Alloys Corp., Flushing N. Y. Before going with Eutectic, Mr. Hillman was assistant sales manager of White Metals Rolling and Stamping Corp. JOSEPH QUAAS has been appointed manager of the electrode production division. He is a member of the AWS and the American Association for the Advancement of Science, and was formerly with Metal & Thermit Corp. as a research man.

* * *

JACK HARRIS has been appointed district engineer in the newly-opened Milwaukee office of KSM Products, Inc., Merchantville, N. J. He will provide stud-welding services and products in that area.

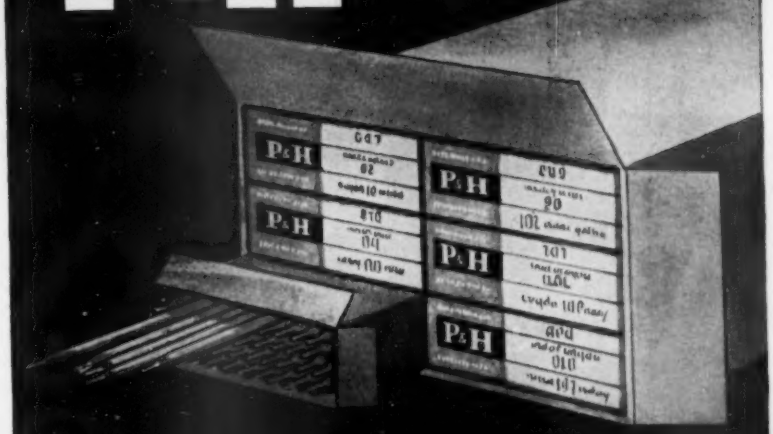
* * *

EDGAR W. BARTZ has been appointed Pacific Coast district welding supervisor for Westinghouse Electric Corp. An arc welding specialist for 14 years, he is well known in western industries and shipyards. He is second vice-chairman of the San Francisco section of the American Welding Society. WAYLAND A. HEDING has been named welding application engineer in the Los Angeles office serving southern California and Arizona.

* * *

B. W. GOULDING has been appointed vice-president in charge of the compressed gas division of the Liquid Carbonic Corp., Chicago. He will be responsible for sales, manufacture and distribution.

P&H



economical

Handy, small-package assortment of electrodes for repair and maintenance welding

P&H

Maintenance Pack

7 different electrodes
(Approximately 27 lbs.)

- ★ AC-3, 1/8", 5/32", 3/16" — For all position welding of mild steels and sheet metal. AC or DC.
- ★ AC-1, 5/32" — For mild steels. AC or DC.
- ★ 70LA2, 5/32" — For high-carbon, alloy, high-sulfur, free-machining, cold-rolled, and other hard-to-weld steels. Ideal for steel casting repairs. AC or DC.
- ★ Harstain, 1/8" — For spring steels and stainless steels of all kinds. AC or DC.
- ★ Nicast, 1/8" — For machinable welds on cast iron. Nicast welds are strong and non-porous.

$13.90
for complete assortment

Why buy seldom-used electrodes in quantities larger than you need? Now, in one convenient package, you can keep some of each type on hand economically — and get replacement packages as you need them.

The P&H Maintenance Pack equips you to do all kinds of repair and maintenance jobs with the *right* electrode. All rods are packaged to stay dry — and are clearly labeled to make selection easy.

Be ready for emergencies. Save time, trouble, money. Order a P&H Maintenance Pack from your P&H representative or local distributor. If you don't know who he is, write for his name.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4513 West National Ave., Milwaukee 46, Wis.

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the P&H Line

National
Carbide
EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding & Cutting
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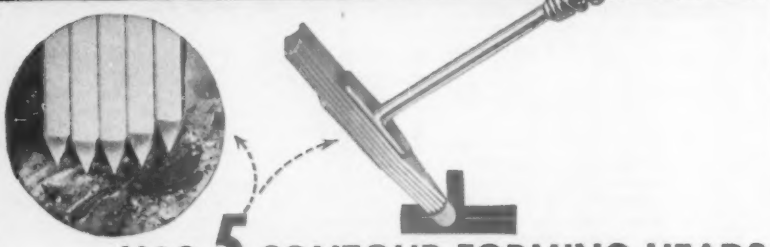
NATIONAL CARBIDE IN THE RED DRUM
Write us for information as
to nearest available stock.
NATIONAL CARBIDE COMPANY
A Division of Air Reduction Company, Inc.
60 E. 42nd St., New York 17, N. Y.

Multi-Pic
WELD CLEANING HAMMER

HAS 5 CONTOUR FORMING HEADS
Patented FREE-FLOATING HEAD design delivers FIVE cleaning blows with each swing.
CUTS TIME—Cleans FIVE times faster
CUTS COST—Lasts FIVE times longer
THAN SINGLE HEADED HAMMERS
Illustrated Model No. MP-2-M $2.40 each—quantity prices 10% to 20% less.
Wood Handle and Brush equipped Models also available—Write for Booklet Form MP-6.
Mfg. by
BERNARD WELDING EQUIPMENT CO.
10232 AVENUE N, CHICAGO 17, ILLINOIS

Died . . .

ROYAL E. FRICKEY, 73, retired electrical research engineer, died in San Francisco, Dec. 27. A 1906 graduate of the University of California, he was for many years associated with Morrison-Knudsen Co., in San Francisco and with the Teleweld Co., Chicago. He did extensive development work with electrical equipment for the construction industry and invented welding and heating apparatus for treating and cutting rails.

* * *

JAMES G. MCCARTY, retired district manager for the Metal & Thermit Corp. in Canada, died on Dec. 24 in Buffalo, N. Y.

* * *

E. L. (THE MAJOR) PARCHMAN, 73, died at his home in Oklahoma City, Okla., on Dec. 17. For the past 11 years Mr. Parchman represented the Sellstrom Mfg. Co., Chicago, calling on welding supply dealers throughout the South and Southwest.

* * *

CHESTER O. BARNES, sales manager of Harnischfeger Corp.'s hoist division died of a heart attack on Dec. 17 in Milwaukee. Mr. Barnes joined P&H in 1941, later becoming a salesman in the welder division. In 1945 he became supervisor of welder dealers in the Pittsburgh territory. He was appointed sales manager of the hoist division in 1951.

* * *

ALFRED M. JONES, midwest sales representative for International Graphite & Electrode Division of Speer Carbon Co. died of a heart attack on Dec. 8 in Milwaukee. He had been with Speer since 1934.

* * *

C. E. CARLSON, 49, passed away Dec. 8 in Chicago. He was a research man at Chicago Bridge & Iron Co., specializing in the stress analysis of pressure vessels and steel plates. He was a member of the Society for Experimental Stress Analysis and the AWS.

* * *

E. G. DANIELS, 76, retired plant mechanical engineer for Chicago Bridge & Iron Co., Chicago, died on Dec. 8. An employee of the company for 43 years, he retired in 1945 after supervising installation of mechanical and electrical equipment in floating dry docks built for wartime use. He also was well known for his work in designing heavy fabricating and metalworking machinery for making tanks and vessels

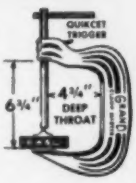
GRAND

SPEED CLAMPS

A S L SERIES

SAVE MINUTES ON EVERY CLAMPING OPERATION!

Grand Speed Clamps are quick setting and instant releasing—just push down the screw and tighten with a turn on the vise-type handle. Trigger releases work instantly.



Grand Speed Clamps have extra deep throats—are ruggedly built of NACO No. 6 Steel—spatter proofed.

4 Sizes: 2" to 8" Opening

Famous GRAND "C" Clamps

Alloy Steel (Stronger than forged) Spatter-Proofed Screws, Deep Throat—Replaceable Swivels

LIGHT SERVICE SERIES	MEDIUM SERVICE SERIES	HEAVY SERVICE SERIES
L SERIES	ASM SERIES	ASH SERIES
8 SIZES 2" TO 12"	7 SIZES 4" TO 18"	8 SIZES ¾" TO 12½"

Ask Your Supplier

GRAND SPECIALTIES CO.

3101 W. GRAND AVE., CHICAGO 22

30 YEARS AGO

(Taken From THE WELDING ENGINEER *of* Feb., 1923)

WELDING the nosepiece on a pair of spectacles is the smallest job a Maryland job shop has ever done. A customer brought in a pair of pince-nez glasses broken in the bridge. The shop owner submerged the glasses in a can of water with the break just at the surface. He used a gold stock pin for a filler rod and his smallest welding torch, needless to say.

—30 YEARS AGO—

MOST interesting story in this issue is a tale about welding a 10-in. wrought iron waste pipe to a 12-in low pressure steam line without one minute's interruption of the latter line's service. A highly skilled oxy-acetylene weldor did the job in several hours for a fee of $250. Steam and waste water from the 12-in. line made him look like a drowned rat when he finished, spectators said.

—30 YEARS AGO—

THE American Electric Fusion Corp. has purchased a site in Chicago for its new factory. The firm's 1923 expansion plans call for a total floor space of between 80,000 and 100,000 sq ft.

Solves Electrode Stabilization Problem!

GRIEVE-HENDRY

8 DRAWER PORTABLE ELECTRODE OVEN

DRAWERS: 2" high, 11½" wide, 23" deep.

$194.50 F.O.B. CHICAGO

Eight individual drawers provide utility, reduce heat loss and separate various types and sizes of electrodes.

Adjustable temperature control. Controlled fan-driven forced air circulation. Low operating cost. Plugs into any 110 volt A.C. outlet. (220 volt, D.C. and others available.) Other standard models with temperature ranges to 1000°F.

Sold through Dealers and Distributors. Write.

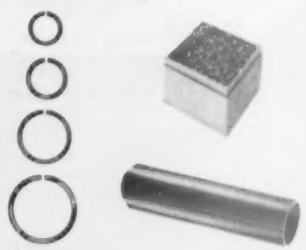
GRIEVE-HENDRY CO., INC.

1815 W. LAKE ST., DEPT. WE
CHICAGO 12, ILLINOIS

E. Chicago
Cleveland
Mexico City, D.F.
Wherever You Are
"YOU'RE WELDS AHEAD"
with
CHAMPION
WELDING ELECTRODES
• Champion Welding Electrodes and Champion Welding Accessories live up to their name for superiority from coast to coast.
Choose Champion and insure complete satisfaction on every application.
Detailed bulletin regarding YOUR specific problems on request. Send for it.
THE CHAMPION RIVET CO.
CLEVELAND, OHIO • East Chicago, Ind.

ORDNANCE CONTRACTORS! READ THIS!

If your shell, rocket or Burster job specifies brazing with Silver Alloy Rings, it will pay you to contact the *one manufacturer who completes the job* — and at minimum costs.



Alloying to certified Govt. Specifications, rolling, wire drawing and *ring forming to your Blue Print tolerances* — *all* these processes performed in *one* UNITED WIRE mill! Meaning . . . *one* control — of alloy composition, of precise ring dimensions, of shipping schedules! And . . .

A competent and experienced staff of brazing specialists, with their completely modern laboratory, is anxious to work with you.

If you have any silver alloy brazing problems, why not turn them over to

United WIRE

PRODUCERS OF:
★ SIL-BOND 50 Govt. Grade IV
★ SIL-BOND 45 Govt. Grade VII
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★ SIL-FLUX Govt. 4-1121

Contact your nearest UNITED WIRE Welding Supply distributor or write our nearest office.

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PROVIDENCE, RHODE ISLAND
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Hartford, Conn.

140

BOOK REVIEWS

Welding Stainless

WELDING PROCESSES AND PROCEDURES EMPLOYED IN JOINING STAINLESS STEELS. By Helmut Thielsch. Published by the Welding Research Council, New York, 1952. Paper, 8 by 11 in., 48 pages. Price $2.

This booklet is a detailed handbook-type review of published and the latest unpublished information on metal-arc, carbon-arc, gas and resistance welding of stainless steels. The most recent developments and modifications of these processes as well as those for flame cutting stainless are included.

Each process is discussed as to characteristics, advantages and limitations. The current welding practice in each major process is outlined as to preparation of base metal, joint design, jigs and fixtures, welding techniques, defects in welded joints, their causes and prevention, mechanical properties and applications.

Detailed tables are provided for each process, giving recommended electrode or filler metal wire sizes, current and voltage settings, welding speeds, joint designs, etc. Altogether there are 31 tables, 16 figures and 242 references to published and unpublished information.

* * *

Chemical Plant Procedure

CHEMICAL ENGINEERING OPERATIONS. By Frank Rumford. Published by the Chemical Publishing Co., Inc., New York City 10, 1952. Cloth, 5½ by 8½ in., 376 pages. Price $7.50.

A clear picture of the basic operating principles of chemical plants may be obtained from this book. It discusses the most important processes used today and describes and illustrates the principal types of apparatus for carrying them out.

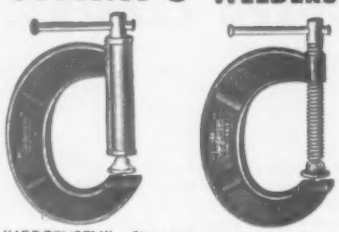
The theoretical aspects of chemical works procedures are covered and their mathematical foundations given. Considerable space is devoted to the practical phases though. Processes and equipment are evaluated as to efficiency and economy. Illustrative examples are listed for every operation treated, including the calculation of results and graphical presentation.

More than 200 excellent illustrations are provided that should be helpful to the chemical technologist and engineer, particularly beginners or students.

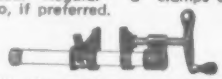
* * *

To obtain additional information on any advertised products, use the cards on pages 17-18.

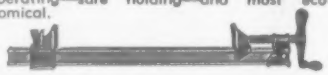
"Jorgensen" and "Pony" CLAMPS for WELDERS:



"JORGENSEN" Shielded Welders' Clamps eliminate damage from "spatter", and are low-priced. "Regular" "C" clamps are available too, if preferred.



"PONY" Clamp Fixtures make ideal bar clamps on any length of black pipe. Fast operating—sure holding—and most economical.



"JORGENSEN" Steel Bar Clamps are designed for the severe requirements of welding service; exclusive "multiple disc clutch" makes for instant adjustment—economy. The trade-mark "JORGENSEN" or "PONY" on your clamps is assurance of utmost satisfaction in service—specify and insist upon them from your supplier. FREE CATALOG ON REQUEST.

ADJUSTABLE CLAMP COMPANY
"The Clamp Folks"
426 N. Ashland Ave., Chicago 22, Ill.

For Closer-Grained Cast Iron Welding
USE
Fuse-Well
No. 14

An improved rod of high tensile strength that gives you cast iron welds that are easily machined, non-porous, gas tight and leak proof.

Fuse-Well
SQUARE AND ROUND CAST IRON WELDING RODS AND ELECTRODES
"Flux-Well" Welding Fluxes
Sold Thru Leading Distributors
THE CHICAGO HARDWARE FOUNDRY CO.
"Dependable Since 1897"
NORTH CHICAGO, ILLINOIS

WELDING CURTAINS

Workers and passers-by are protected from harmful rays given off by welding operations. Also serve as a protective shield against flying chips and scale. Made of special flameproof and waterproof canvas — or asbestos — complete with eyelets for suspending on rod or pipe support.

WRITE FOR BULLETIN A-43

IPCO *Safety Equipment for all Industries*
INDUSTRIAL PRODUCTS COMPANY
2802 N. FOURTH STREET, PHILADELPHIA 33, PA.

BUY

SELL

USE

SHAWINIGAN CARBIDE

SHAWINIGAN PRODUCTS CORPORATION
EMPIRE STATE BUILDING
NEW YORK 1, N. Y.

Welding Marine Piping

RULES FOR WELDING PIPING IN MARINE CONSTRUCTION, FERRITIC ALLOY STEELS. Published by the American Welding Society, New York, 1952. Paper, 6 by 9 in., 12 pages. Price 50c.

This new standard deals with ferritic alloy steel piping and covers the following aspects: design considerations, joint design, joint preparation, use of backing rings, selection of filler metal, qualification of weldors and welding procedures, preheat and interpass temperature control (including recommended temperatures for different alloys), tack welding and clamping, weld quality, postweld heat treatment, inspection and hydrostatic testing. For the first time a radiographic standard has been included for evaluating weld quality.

These rules represent requirements that are acceptable to all the enforcement agencies in the shipbuilding industry (American Bureau of Shipping, U. S. Navy and U. S. Coast Guard).

* * *

Temperature Control

MEASUREMENT AND CONTROL OF TEMPERATURES IN INDUSTRY. By R. Royds. Published by Chemical Publishing Co., Inc., New York 10, 1952. Cloth, 5½ by 8½ in., 260 pages. Price $5.

Here are presented the latest developments in temperature measuring and control techniques and devices in a number of basic industries. These include the metal, chemical, petroleum, cement, paint, rubber and textile fields as well as other industries where it is desired to maintain very high thermal efficiencies.

Considerable space in the book is devoted to the standardization problems and to automatic controls of temperatures. Attention is also given to improving the quality and reliability of industrial products by better temperature controls. Attendant advantages of increased production rates and lower fuel and labor costs are also brought out.

Newest NWSA Members . . .

SIX new members were received at zone meetings of the National Welding Supply Association in December. They are: Carolina Welding Supplies, Inc., 410 DuPont Circle, Raleigh, N. C.; Eastern Distributors, Inc., P. O. Box 631—800 South John St., Goldsboro, N. C.; Industrial Welding Supplies, 351 St. Louis St., Mobile, Ala, and West Virginia Supply & Equipment, Clarksburg, West Va.

Now,

GOUGE and CUT ANY METAL

—with only carbon arc and compressed air!

The new Arcair* method is now saving thousands of manhours, cutting operating costs for materials up to 80%, and solving many metal removal problems for progressive fabricators, foundries and other users.

Originally designed for gouging stainless steel, the Arcair Torch has found wide application among ***fabricators*** using all types of ferrous and non-ferrous alloys. In ***foundries,*** the Arcair method is being applied with notable success to gouge defects and to remove unwanted metal. ***Maintenance*** of mine, quarry, railroad construction and plant equipment provides other profitable uses.

The unique Arcair TORCH, with its air control valve, self-aligning rotating jet and concentric cable is all the equipment needed — complete at just **$87.50**

Prove its savings in your own plant

Write today for literature and name of nearest dealer. Demonstration in your plant can be arranged in most areas.

*TRADEMARK

Arcair

2614 Burwell Street BREMERTON, WASH

Cut Your Gas Bill Up To ONE-HALF!

PILOT-LIGHT FLAME

- Saves gas . . . saves time
- Full "pre-set" heat instantly
- No re-adjustment
- No re-lighting

MARQUETTE
REG. IN U. S. PAT. OFFICE

MODEL H

INSTANT HEAT AUTOMATIC Welding Torch

With Marquette's new "Instant Heat" automatic torch, you light once, adjust once . . . and let the pilot light burn between welds. Press the lever . . . you get full flame instantly. Release it, and it cuts automatically to a tiny pilot flame, saving up to one-half on gas. Marquette's Instant Heat Automatic Torch is a precision-made instrument, embodying such features as "O"-Ring seals, full tip swivel, stainless steel heat barrier. Write for complete information.

MARQUETTE
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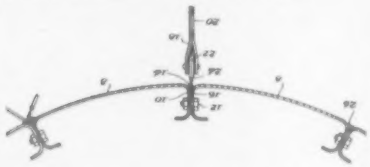
Welding & Automotive Service Equipment

MARQUETTE MANUFACTURING CO., INC.
307 E. Hennepin Avenue • Minneapolis 14, Minnesota

From the Patent Office

Welding Calked Joints

2,621,399. ARTHUR C. THOMPSON, Baltimore, Md. Assigned to Koppers Co., Inc., Pittsburgh. Filed April 3, 1947. Granted Dec. 16, 1952.

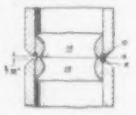


This process is used in the construction of lift-type gas holders comprising a series of panels which are bolted together. The panels have outwardly opening crevices at the bolted-together joints through which air can escape when the internal air pressure in the vessel is greater than atmospheric pressure. So that such joints can be welded while the internal pressure is greater than atmospheric they are calked with a combustible material impregnated with a fire retardant. When the calked joints are welded, the calking material burns out slowly under the heat of welding.

* * *

Contact Welding Electrode

2,623,147. PAUL CHRISTIAAN VAN DER WILLIGEN, Eindhoven, Netherlands. Assigned to Hartford National Bank and Trust Co. Filed Feb. 16, 1950. Granted Dec. 23, 1952.



A newly patented electrode for contact arc welding comprises an iron core and a coating containing powdered iron. The total amount of iron constitutes from 75 to 86% of the total weight of the electrode. From 15 to 20% by weight of this iron is contained as powdered iron in the coating. The rest of the coating is substantially the following in percentages by weight: titanium dioxide, 10 to 50; carbohydrate, 10 to 30; silicate, 20 to 40; manganese alloy, up to 10 and manganese compound capable of evolving oxygen at welding temperatures, 3 to 30.

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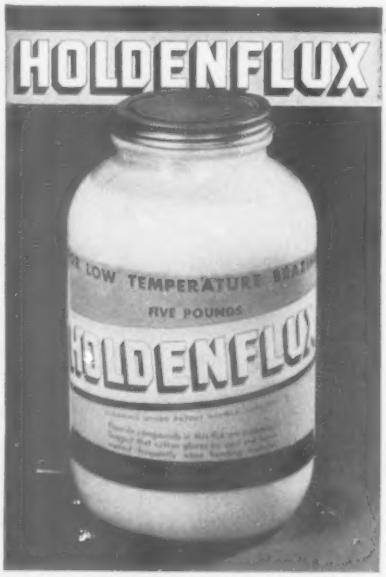

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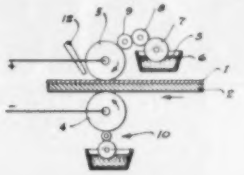
RIO, WISCONSIN

Spot Welding of Tantalum

2,620,424. GEORGE OTTO, Gurnee, Ill. Assigned to Fansteel Metallurgical Corp., North Chicago, Ill. Filed Dec. 29, 1950. Granted Dec. 2, 1952.

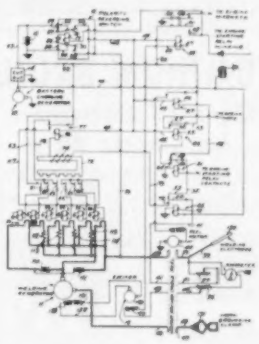


This patented resistance welding method produces a composite metallic body consisting of at least two metal elements, at least one of which is tantalum. A thin film of carbon is placed between the welding electrodes and the metal pieces. The electrodes are made of a metal whose melting point is of substantially lower order than that of tantalum. An electrical welding current is passed through the electrodes, carbon films and metal elements.

* * *

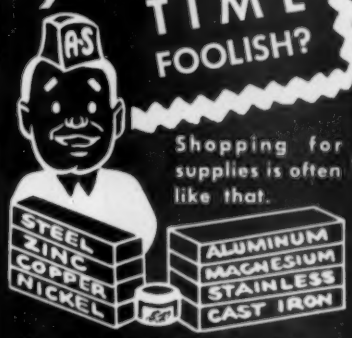
Remote Control for Welder

2,618,775. ALBERT R. SHAY, Mantua, O. Filed July 29, 1948. Granted Nov. 18, 1952.



This patent covers a system for remotely controlling an engine-driven welder. It includes an exciter for the welding generator, a battery-charging generator with a reverse current shutout and a reversing switch in the generator circuit. This latter reverses the polarity of the first generator. A rheostat is in series with the field of the exciter. Hand-operated means are provided for adjusting the rheostat. A shunt is connected to the first generator (welding). A second rheostat is electrically connected to the shunt and relay field circuit. The second rheostat is connected to the reversing switch so that as the driven generator is controlled by the rheostat (for starting and stopping) the switch will be operated to change the polarity of the first generator.

EVER BEEN PENNY WISE— TIME FOOLISH?



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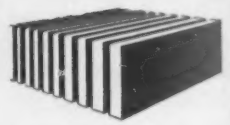

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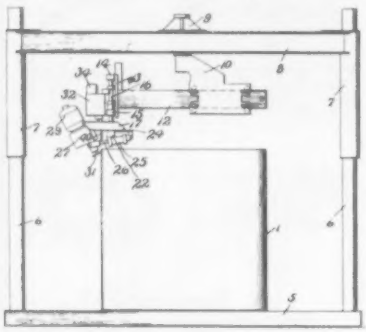
Producers of Weldspool Precision Wound Electrode Wire for Inert Gas Welding

Technical Information Available upon Request

Welding Fixture

2,618,727. HORACE ADRIAN OSBORNE, Frankfort Township, Will County, Ill. Assigned to Morton Mfg. Co., Muskegon Heights, Mich. Filed Dec. 21, 1950. Granted Nov. 18, 1952.

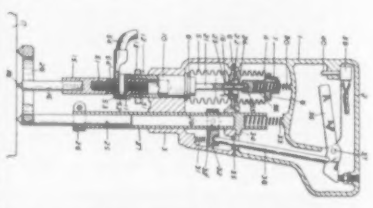


This patent concerns a machine for automatic fusion welding of the upper edge of a vertical flange. It includes a head, means for supporting it for universal movement in a horizontal plane and a pilot member fixed to the head and traversably contacting an inner surface of the flange. A driving member is movably connected to the head and traversably contacts an outer surface of the flange. Means are provided for driving the driving member at uniform speed. A support is movably mounted on the head independent of the driving member. A locating member is mounted on the support and traversably contacts the outer surface of the flange directly opposite the pilot member. A guide for a welding head is fixed to the support above the edge of the flange and in alignment between the axis of the pilot member and locating member. Means are provided for moving the support and holding the locating member against the flange whereby the guide is accurately located relative to the flange during traversing movement.

* * *

Stud Welding Gun

2,622,179. TREVOR LUMSDEN HERBERT BUTTERFIELD, Guildford, England. Assigned to Blower & Sidney, Ltd., Slough, England. Filed Feb. 23, 1951. Granted Dec. 16, 1952.



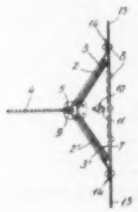
A newly patented stud welding tool comprises a body, a stud-chuck spindle and a reaction device mounted on the body. The reaction device

comprises two axially aligned and sealed upper and lower spring bellows containing a fluid. A fixed partition with a valve orifice separates the two bellows. A return spring is between the body and the upper bellows. The stud-chuck spindle is permanently fixed to the lower bellows with its upper end contained within the lower bellows and passing through the orifice in the partition into the upper bellows to enable the reaction device and the return spring to be energized by forcible application of the tool to the workpiece. The upper end of the stud-chuck spindle is formed as a valve to regulate, subsequent to the energization of the reaction device and return spring, the flow of fluid through the orifice in the partition. This is for the purpose of first retarding the movement of the stud-chuck spindle during fusion of the stud next to the workpiece and the formation of a molten crater in the workpiece and then permitting of rapid movement of the stud-chuck spindle to drive the stud into the molten crater. Both the slow and rapid movements are effected uninterruptedly by and under control of the energized reaction device and the same return spring end being initiated by the flow of welding current.

* * *

Welding Helmet Windows

2,618,781. ANDRE R. BEAUVERGER, Beziers, France. Filed Feb. 21, 1950. Granted Nov. 25, 1952.



This patent refers to a weldor's opaque protective helmet having two window openings. A translucent solid sheet member is mounted in one of the window openings. A transparent solid sheet member is mounted in the other window. The two sheet members are placed in the mask to form an acute angle of which the vertex is outwardly directed from the mask. A rotatable screen is pivoted on the mask outside of the vertex. Means are provided for setting the screen into at least two positions including a forwardly projecting intermediate position between the two sheets and a position overlying the transparent sheet member.

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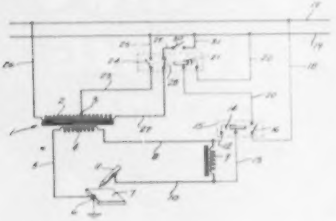
Low Open-Circuit Voltage A-C Welding Circuit

2,617,913. SOL OESTREICHER, Milwaukee. Assigned to Harnischfeger Corp., Milwaukee, Wis. Filed Sept. 30, 1950. Granted Nov. 11, 1952.



A newly patented a-c welder has a primary-circuit voltage-reducing impedance and a primary circuit contactor having an actuating coil. There are a set of reduced-voltage contacts and a set of welding-voltage contacts. Reduced-voltage circuit connections join the primary winding through the reduced-voltage contacts when closed and in series through the voltage-reducing impedance to the current supply terminals. Welding-voltage circuit connections join the primary winding through the welding-voltage contacts when closed directly to the supply terminals. Welding current responsive means are interposed in the secondary circuit of the transformer connected to and adapted to energize the coil of the primary circuit contactor. They cause the welding contacts only to be closed when current is flowing in the secondary circuit. They are adapted to cause the reduced voltage contacts only to be closed when current is not flowing in the secondary.

* * *

Welding Rimmed Steel

2,621,278. ALBERT MULLER, Plainfield, N. J. Assigned to Air Reduction Co., Inc., New York. Filed June 21, 1950. Granted Dec. 9, 1952.

A newly patented method of welding ferrous metals such as rimmed or semi-killed steel containing substantial amounts of oxygen and carbon includes the following: fusing a portion of the ferrous metal with an electric arc to form a weld pool of molten metal; feeding into the weld pool a bare ferrous wire composed principally of iron containing carbon, manganese, silicon and from 0.02% to 0.18% of aluminum as an essential active ingredient; and blanketing said arc, the consuming end of the filler wire and the weld pool with a stream of inert monatomic shielding gas to exclude air from the molten steel and prevent loss of the deoxidizer.

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NAT. 5's, HARRIS K's.
SEAM WELDER, Progressive 150KVA, New.
SPOT WELDER, National, 40 KVA, used.
CUTTING TORCHES, used, Harris & Airco.
BRONZE, STAINLESS, AMPCOTRODES.
NO. 12 LENSES, ELECTRODE HOLDERS.
RALL SUPPLY CO. 6 E. 39th St., NYC 16

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TWECOTONG

LIGHTWEIGHT HOLDER

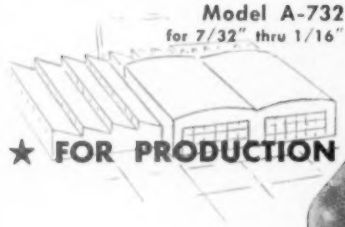
It's New

tough

..light..weighs only 18 ounces

300 AMP. CAPACITY

Model A-732
for 7/32" thru 1/16" rod



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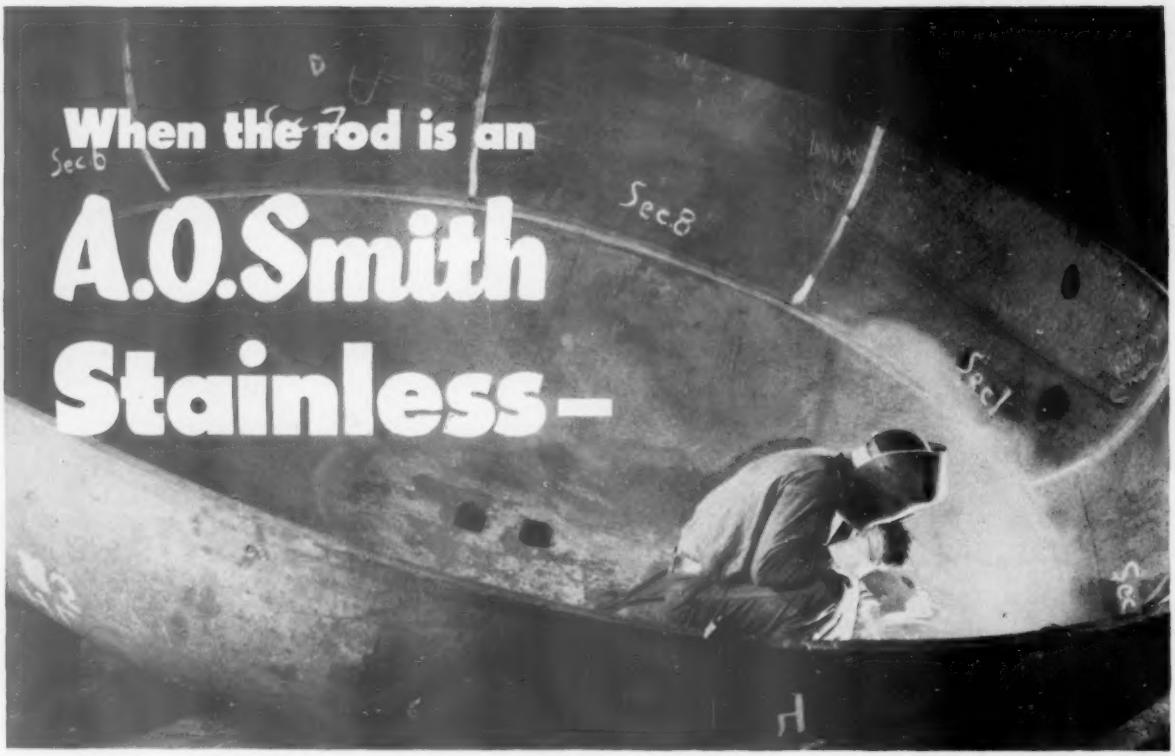

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BECAUSE of A. O. Smith's matchless quality control

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For your protection here are some of *our* controls: No more than one splice is permitted in any incoming coil. Why? So that, when we clip samples from each end of each coil for analysis, no part of any coil can escape the test. Then, when approved coils are straightened and cut, the wire is immediately sealed in boxes to prevent mixing of lots.

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Electrode	AISI Type
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SW-152	505
SW-153	410
SW-154	430
SW-157	347
SW-158	317+Cb
	318
SW-159	310
SW-160	316
SW-161	317
SW-162	308
SW-166	309
SW-168	310+Mo
SW-169	310+Cb
SW-357	347
SW-359	310
SW-362	308

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